

**UUT Qualification Testing  
Per  
“Vehicle Awareness Device” Specification  
20111202 Release, V3.5, Count 16 Qualification  
20120125 Release V3.6, Count 17 Testing**

**Test Case / Report Data Sheet, V10 (9/10/2012)**

**[Insert Manufacturer & Device Model #]**

**Month 2012**

Issue date: [DD Month 2012]

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## SUMMARY:

Regression Testing (Yes/No):

No (Certification)

Last published test report:

OMNI-00## dated mm/dd/2012 (screening)

Bench Testing	Pass/Fail	Comments
Visual Inspection		
Supplier Test Report Update		
UUT Start-up Default Configuration @ FW Load		
Power Cycle Tests (On/Off/Log Files) Conducted Power Leads Transient		
<b>UUT PCAP File Packet Decoding:</b> <ul style="list-style-type: none"> <li>IEEE 1609.2 Security Disabled or No Security</li> <li>IEEE 1609.2 Security Enabled</li> </ul>		
<b>“Over-the-Air” Capture &amp; PCAP File Decoding:</b> <ul style="list-style-type: none"> <li>IEEE 1609.2 Security Disabled or No Security</li> <li>IEEE 1609.2 Security Enabled</li> </ul>		

Vehicle Installation & Field Tests	Pass/Fail	Comments
Vehicle Type		SUV & Four Door Sedan
Electrical & Antenna Connection		
<b>Transmission Range Check</b> <ul style="list-style-type: none"> <li>Static @ 300m w/OBU Rcv Antenna</li> <li>Mobile @ 0-350m &amp; &lt;20 MPH w/OBU Rcv Antenna</li> <li>Vehicle Rotation (360 degrees) @ 0-350m</li> <li>XY Positioning Services @ 20/45/60 mph</li> <li>Elevation Positioning Services @ 20/45/60 mph</li> <li>BSM Part II PathHistory &amp; Path Predication</li> <li>Hard Braking Event Population</li> <li>Heading Latching &amp; Unlatching</li> </ul>		

## Vehicle Operation Test regarding Positioning Services Accuracy:

[Insert Plot]	[Insert Plot]	[Insert Plot]
XY @ 20 mph	XY @ 45 mph	XY @ 60 mph

Summary Comments and Observations:
<ul style="list-style-type: none"><li>• X</li><li>• X</li><li>• X</li><li>• X</li><li>• X</li><li>• X</li><li>• X</li></ul>

## RECEIVE-INVENTORY-INSPECT LOG

Shipment Received From: USDOT RITA      Received Date:  
 Device Model No:      Quantity Received:  
 Firmware Version:

Shipment Contents:

Item	Model No.	Serial Number	Pictures?
[Unit # 1]			
[Unit # 2]			
[Unit # 3]			
[Unit # 4]			

Antennas Tested:

Hirschman Sharkfin DSRC/GPS Antenna & 5M DSRC Cable	HDSC-HG-0107A-02		
Mobile Mark Window Mount DSRC/GPS Antenna & 5M DSRC Cable	IW-5900/1575-7C2HC-BLK-192		
GPS Antenna & Cable	?		

**Table 1 - Inventory List**

Are there visible signs of damage during shipping? **Yes/No**

Has updated User Manual been supplied? **Yes/No**      Date Revision: [insert]

Has updated Test Report been supplied? **Yes/No**      Date Revision: [insert]

Have all accessories been provided to run the UUT device? **Yes/No**

Contact information of the Customer (contracted) is:

**Walt Fehr, USDOT RITA, 1200 New Jersey Ave NE, Washington, DC 20590,**  
**[Walton.fehr@dot.gov](mailto:Walton.fehr@dot.gov), 202-366-0278 office.**

Contact information of the Safety Pilot Model Deployment User is:

**Debby Bezzina, University of Michigan Transportation Research Institute, 2901**  
**Baxter Road, Ann Arbor, MI 48109-2150, [dbezzina@umich.edu](mailto:dbezzina@umich.edu), 734-763-2498**  
**office.**

Contact information of the Device Manufacturer is:

OMNI-[#####]

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**[Insert Lead Contact, Company Name, Company Address, Phone Number, Email Address & Company Website] \* Delete if anonymous report \***

Photographs:

<p>[Insert, Top View]</p>
<p><b>Photograph 1 – Top View (with Dimensions)</b></p>
<p>[Insert, Front Side View]</p>
<p><b>Photograph 2 – Front View</b></p>
<p>Back Side View]</p>
<p><b>Photograph 3 – Back Side</b></p>

### Summary of Inspection Requirements (update for regression testing):

Requirements [Failed Attribute]	Screening [Pass/Fail/ Missing/NI]	Comments
Mechanical		
Performance		
Environmental		
Functional		
Operations States		
Operational Configuration		
Transmit Message Log		
Device Positioning & Timing		
Device Security		
DSRC Radio System		
IEEE 802.11		
IEEE 802.11p		
IEEE 1609.2		
IEEE 1609.3		
IEEE 1609.4		
Radio Performance		
Congestion Control		Under Development at CAMP
Other Communications		
WSMP Processing: Basic Safety Message		

NI – Not Inspected or Re-Inspected



## Summary of Testing Requirements:

Requirements [Failed Attribute]	Screening [Pass/Fail/NT /Evaluating ]	Comments
Mechanical		
Performance		
Environmental		
Functional		
Operations States		
Operational Configuration		
Transmit Message Log		
Device Positioning & Timing		
Device Security		
DSRC Radio System		
IEEE 802.11		
IEEE 802.11p		
IEEE 1609.2		
IEEE 1609.3		
IEEE 1609.4		
Radio Performance		
Congestion Control		Not released by CAMP
Other Communications		
WSMP Processing: Basic Safety Message		

NT – Not Tested or Re-Tested

## INSPECTION (Remove if Regression Testing):

Verification of Requirements was completed by visual inspection of UUT Device and their Manufacturer's Test Report. (Boldface requirements are verified indirectly during Conformance Test Cases)

NOTE: The column labeled "Verified" means that the tester verified that the Manufacturer's Test Report indicates if "Yes" it complies with the requirement, "No" it doesn't comply with the requirement or "Missing" they didn't test the device against the requirement.

MR = Manufacturer Remarks, TBD = To Be Determined

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
<b>Mechanical</b>					
OBE-SYS001 Device Installation	Mandatory				
OBE-SYS002 Device Mounting	Mandatory				
OBE-SYS003 Windshield or Dashboard Form Factor	Mandatory				
VAD-SYS001 Device Form Factor Size (20x12x3cm)	Mandatory				
<b>Performance</b>					
<b>OBE-SYS004 Device Transmitter Failure</b>	<b>Mandatory</b>				
OBE-SYS005 Mean Time Between Failure (MTBF>10K hr)	Mandatory				
VAD-SYS002 Vehicle Types <ul style="list-style-type: none"> <li>• <b>Light Duty Passenger</b></li> <li>• Light Duty Truck</li> <li>• Class 8 Tractor w/Trailer</li> </ul>	Mandatory				
<b>Environmental</b>					
<b>OBE-SYS006 Device Power Source (+9-+16V)</b>	<b>Mandatory</b>				
<b>OBE-SYS007 Max Operating Current (&lt;1A)</b>	<b>Mandatory</b>				
<b>OBE-SYS008 Max Standby Current (&lt;1.0mA)</b>	<b>Mandatory</b>				
OBE-SYS009 Temperature Operating Range (-40 to +85°C)	Mandatory				
OBE-SYS010 Shock & Vibration in Moving Vehicle (SAE J1211)	Mandatory				

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
OBE-SYS011 Shock & Vibration Due to Shipping (SAE J1211)	Mandatory				
OBE-SYS012 Device Electrostatic Discharge (SAE J551)	Mandatory				
OBE-SYS013 Removable Storage Electrostatic Discharge(SAEJ551)	Mandatory				
<b>OBE-SYS014 Conducted Power Lead Transients (SAE J1113)</b>	<b>Mandatory</b>				
<b>OBE-SYS015 Reversed Battery Leads</b>	<b>Mandatory (New)</b>				
<b>Functional</b>					
<b>OBE-INT001 Vehicle Interface-Power using Delphi Micro HVT Connector (Appendix A &amp;SAE J2922)</b>	<b>Mandatory</b>				
OBE-INT002 Vehicle Interface – Vehicle Data Bus	Optional				
<b>OBE-INT003 Local Systems Interface A or B (LSI)</b>	<b>Mandatory</b>				
<b>VAD-INT001 DSRC Radio I/F (5.9 GHz per IEEE 802.11p/1609)</b>	<b>Mandatory</b>				
<b>OBE-INT004 Antenna Interface (USCAR18 FAKRA SMB Female “Z” for DSRC &amp; “C” for GPS)</b>	<b>Mandatory</b>				
<b>Operations States</b>					
<b>OBE-OMC001 State Transition – Initial to Operate</b>	<b>Mandatory</b>				
<b>OBE-OMC002 State Transition - Operate to Quiet</b>	<b>Mandatory</b>				
OBE-OMC003 State Transition - Operate to Halt (B LSI Optional)	Mandatory (A LSI)				
<b>OBE-OMC004 State Transition - Operate to No Power</b>	<b>Mandatory</b>				
OBE-OMC005 State Transition - Quiet to No Power	Mandatory				
<b>OBE-OMC006 State Transition - Quiet to Operate</b>	<b>Mandatory</b>				
<b>OBE-OMC007 State Transition - No Power to Operate</b>	<b>Mandatory</b>				
<b>OBE-OMC008 State Transition - Halt to Operate</b>	Mandatory				
<b>OBE-OMC009 State Transition - Halt to No Power</b>	<b>Mandatory</b>				
<b>OBE-OMC010 Device Shutdown Time (&lt;15 sec)</b>	<b>Mandatory</b>				

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
<b>OBE-OMC011 Device Startup Time (&lt;10 sec)</b>	<b>Mandatory</b>				
<b>Operational Configuration</b>					
<b>OBE-OMC012 Device Software/Firmware (version)</b>	<b>Mandatory</b>				
<b>OBE-OMC013 Device Configuration</b>	<b>Mandatory</b>				
OBE-OMC014 Configuration Storage	Mandatory				
<b>OBE-OMC015 Configuration Default</b>	<b>Mandatory</b>				
<b>OBE-OMC016 Configuration Review ("B" Optional)</b>	<b>Mandatory ("A" LSI)</b>				
<b>OBE-OMC017 Configuration Modification via LSI</b>	<b>Mandatory</b>				
OBE-OMC018 Configuration Modification Validation	Mandatory				
<b>OBE-OMC019 Configuration Upload via LSI ("B" Optional)</b>	<b>Mandatory ("A" LSI)</b>				
OBE-OMC020 Configuration Download via LSI ("B" Optional)	Mandatory ("A" LSI)				
OBE-OMC021 Configuration Download Validation	Mandatory				
OBE-OMC022 Configured Operations	Mandatory				
<b>Transmitted Message Log (TML)</b>					
<b>VAD-TML001 Transmitted Message Storage</b>	<b>Mandatory</b>				
<b>VAD-TML002 Transmitted Message Timestamp</b>	<b>Mandatory</b>				
VAD-TML003 Transmitted Message Log Time Threshold	Mandatory				
<b>VAD-TML004 Transmitted Message Log Size Threshold (default – no size limitation)</b>	<b>Mandatory</b>				
VAD-TML005 Transmitted Message Log Close when Halted	Mandatory				
<b>VAD-TML006 Transmitted Message Log Creation</b>	<b>Mandatory</b>				
<b>VAD-TML007 Transmitted Message Log Filename</b>	<b>Mandatory</b>				
VAD-TML008 Transmitted Message Log Retention	Mandatory				
VAD-TML009 Transmitted Message Log Purge	Mandatory				
<b>VAD-TML010 Transmitted Message Log Access</b>	<b>Mandatory</b>				
<b>VAD-TML011 Transmitted Message Log Upload</b>	<b>Mandatory</b>				

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
VAD-TML012 Transmitted Message Log Deletion	Mandatory				
VAD-TML013 Transmitted Message Log 802.11p Frames	Mandatory				
VAD-TML014 Transmitted Message Log Format (PCAP >4.1.2)	Mandatory				
VAD-TML015 Transmitted Packet Log Size (>4GB)	Mandatory				
<b>Device Positioning &amp; Timing</b>					
OBE-POS001 Positioning Determination Occurrence (100ms rate, WSG-84 Ellipsoid)	Mandatory				
OBE-POS002 Vehicle Speed ( $\pm 0.35\text{m/s}$ & $\pm 3^\circ$ when $>12.5\text{m/s}$ )	Mandatory				
OBE-POS003 Vehicle Position (one sigma of $<1.5\text{m}$ Latitude/ Longitude & $<3.0\text{m}$ Elevation)	Mandatory				
OBE-POS004 Positioning Failure Handling (Null)	Mandatory				
OBE-POS005 Positioning Corrections (WAAS On)	Mandatory				
OBE-POS006 System Timing Source (from GPS)	Mandatory				
OBE-POS007 System Time Standard (UTC)	Mandatory				
<b>Device Security</b>					
OBE-SEC001 Communication Interface Access Control	Mandatory				
OBE-SEC002 Secure non-DSRC Communications	Mandatory				
<b>DSRC Radio System</b>					
OBE-DRS001 FCC Regulation 47 Parts 0,1,2&95 CFR Compliance for DSRC, Mask/Class C	Mandatory				
VAD-DRS001 DSRC Radios ( $\geq 1$ simultaneous channels)	Mandatory				
<b>IEEE 802.11</b>					
OBE-DRS002 IEEE 802.11-2007 Conformance	Mandatory				
OBE-DRS003 Physical Layer, Clause 17 & Data Rates	Mandatory				
OBE-DRS004 Modulation Scheme, OFDM	Mandatory				
OBE-DRS005 Default Values	Mandatory				

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
<b>OBE-DRS006 Quality of Service (Data Frames)</b>	<b>Mandatory</b>				
OBE-DRS007 Arbitration Interframe Spacing Value	Mandatory				
OBE-DRS008 Transmission Opportunity Value	Mandatory				
OBE-DRS009 Contention Window Minimum Value	Mandatory				
<b>IEEE 802.11p</b>					
OBE-DRS010 Standards Conformance	Mandatory				
OBE-DRS011 Basic Service Set (OCBEnabled=true)	Mandatory				
<b>OBE-DRS012 Class 17 Channels (10MHz 172-184 Even)</b>	<b>Mandatory</b>				
<b>OBE-DRS013 Class 18 Channels (20 MHz 173 &amp; 181)</b>	<b>Mandatory</b>				
<b>OBE-DRS014 Enhanced Distributed Channel Access (Configurable &amp; defaults set)</b>	<b>Mandatory</b>				
OBE-DRS015 Option Enhanced Receiver Performance (Table 17-13a)	Optional				
<b>IEEE 1609.2</b>					
OBE-DRS016 Conformance (d9.3)	Mandatory				
<b>OBE-DRS017 Security Profile per Appendix C (0x02)</b>	<b>Mandatory</b>				
<b>VAD-DRS002 Certificates (&gt;211k)</b>	<b>Mandatory</b>				
<b>OBE-DRS018 Time Limited Certificates (5min w/30 sec overlap and start/end time)</b>	<b>Mandatory</b>				
OBE-DRS019 Certificate Expiration Deletion	Optional				
OBE-DRS020 Certificate Deletion (manual)	Mandatory				
VAD-DRS003 Certificate Reload via LSI	Mandatory				
<b>OBE-DRS021 Static Certificate in Event Condition</b>	<b>Optional</b>				
<b>OBE_DRS022 Randomize MAC Address on Certificate Change</b>	<b>Mandatory</b>				
VAD-DRS004 Inbound Message Non-Authentication (Congestion)	Mandatory				

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
OBE-DRS023 Inbound Message Acceptance (Congestion)	Mandatory				
<b>IEEE 1609.3</b>					
OBE-DRS024 Standards Conformance	Mandatory				
<b>VAD-DRS005 WSMP (0x88dc)</b>	<b>Mandatory</b>				
<b>OBE-DRS025 BSM as WSMP</b>	<b>Mandatory</b>				
<b>OBE-DRS026 Safety Supplement (0x81, Annex G)</b>	<b>Mandatory</b>				
<b>OBE-DRS027 IEEE 1609.3 WSMP-S Control Field (0x01)</b>	<b>Mandatory</b>				
<b>OBE-DRS028 IEEE 1609.3 PSID (0x20)&amp;Specific User Priority (2)</b>	<b>Mandatory</b>				
<b>OBE-DRS029 WSMP Header Options</b> • Channel Number • Data Rate • Transmit Power	<b>Suggested Mandatory Mandatory</b>				
OBE-DRS030 WSMP Congestion Controlled Transmission Rate	Mandatory				
OBE-DRS031 IP Firewall Rules (Appendix D)	Mandatory				
<b>IEEE 1609.4</b>					
OBE-DRS032 Standards Conformance	Mandatory				
<b>OBE-DRS033 Radio Operating Mode (channel switching, On/Off, Default- Continuous)</b>	<b>Mandatory</b>				
OBE-DRS034 Continuous Channel Mode (no time limitation)	Mandatory				
<b>OBE-DRS035 Alternating Channel Mode</b>	<b>Mandatory</b>				
OBE-DRS036 Service Channel Interval	Mandatory				
<b>OBE-DRS037 Randomize MAC Addresses on Device Power Up</b>	<b>Mandatory</b>				
OBE-DRS038 Service Channel MAC Address Configuration	Mandatory				
OBE-DRS039 Control Channel MAC Address Configuration	Mandatory				

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
OBE-DRS040 Avoid Synchronized Collision	Mandatory				Non-applicable for VAD
OBE-DRS041 Readdressing Option	Mandatory				
<b>Radio Performance</b>					
<b>OBE-DRS042 Transmission Range (1-300m, 90% PER)</b>	<b>Mandatory</b>				
OBE-DRS043 Receive Range (360° from 1-300m, 90% PER)	Mandatory				Non-applicable for VAD
<b>Congestion Control (CC)</b>					Under Development at CAMP
OBE-DRS044 Congestion Control	Optional				
OBE-DRS045 CC Algorithm Loading	Mandatory				
OBE-DRS046 CC Parameters	Mandatory				
OBE-DRS047 CC Parameter Setting on Radio Startup	Mandatory				
OBE-DRS048 CC Indicators (RSS dB, CH% busy, DR Mbps & PER)	Mandatory				
OBE-DRS049 CC Parameter Configuration	Mandatory				
OBE-DRS050 CC Stop	Mandatory				
OBE-DRS051 CC Start	Mandatory				
<b>Other Communications</b>					
OBE-COM1 LSI – Protocol Support (IPv4 & IPv6)	Optional				
OBE-COM2 Secure Non-DSRC IP Communications	Mandatory				
OBE-COM3 Non-DSRC IP Firewall Rules	Mandatory				
OBE-COM4 Non-DSRC IP Com. Account Password Reset (80 bits, 13 Characters)	Mandatory				
<b>WSMP Message Processing</b>					
OBE-MPS001 DSRC BSM (ASN.1 formatting-Blob)	Mandatory				
<b>Basic Safety Message (BSM)</b>					
<b>OBE-BSM001 BSM Generation per configured message rate</b>	<b>Mandatory</b>				
<b>OBE-BSM002 BSM Transmit per configured message rate</b>	<b>Mandatory</b>				
<b>OBE-BSM003 Application Security Profile (Appendix C)</b>	<b>Mandatory</b>				



Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
<b>OBE-BSM004 Part I Transmit Rate (2-20 with 10Hz default)</b>	<b>Mandatory</b>				
<b>OBE-BSM005 Part II Transmit Interval (N=1)</b>	<b>Mandatory (revised)</b>				
<b>OBE-BSM006 Event Triggered Basic Safety Message (&lt; 50ms)</b>	<b>Optional</b>				
<b>OBE-BSM007 Elements - Part I</b>	<b>Mandatory</b>				
<b>OBE-BSM008 Elements - Part II</b>	<b>Mandatory</b>				
<b>OBE-BSM009 Element Values</b>	<b>Mandatory</b>				
<b>OBE-BSM010 Values Population</b>	<b>Mandatory</b>				
<b>OBE-BSM011 MsgCount DE Initialization (0) &amp; Cycle (0-127)</b>	<b>Mandatory</b>				
<b>OBE-BSM012 MsgCount DE Rotation on Temporary ID Change (0-127)</b>	<b>Mandatory</b>				
<b>OBE-BSM013 TemporaryID DE Rotation</b>	<b>Mandatory</b>				
<b>OBE-BSM014 TemporaryID DE Rotation on Certificate Change</b>	<b>Mandatory</b>				
OBE-BSM015 TemporaryID DE Rotation on Reception of Same TemporaryID	Mandatory				
<b>OBE-BSM016 DSecond DE Value Determination (sensor)</b>	<b>Mandatory</b>				
OBE-BSM017 DSecond DE Accuracy (<1ms)	Mandatory				
<b>OBE-BSM018 Latitude DE Value</b>	<b>Mandatory</b>				
OBE-BSM019 Latitude DE Value Determination	Mandatory				
OBE-BSM020 Latitude DE Accuracy (Latency < 1ms)	Mandatory				
<b>OBE-BSM021 Longitude DE Value</b>	<b>Mandatory</b>				
OBE-BSM022 Longitude DE Value Determination	Mandatory				
OBE-BSM023 Longitude DE Value Accuracy	Mandatory				
<b>OBE-BSM024 Elevation DE Value</b>	<b>Mandatory</b>				
<b>OBE-BSM025 Positional Accuracy DF Value (from GPS)</b>	<b>Mandatory</b>				
OBE-BSM026 Speed DE Value Latency (<220ms)	Mandatory				
OBE-BSM027 Speed DE Value Accuracy ( $\pm 0.35$ m/s)	Mandatory				

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
OBE-BSM028 Heading DE Value Latency (<220ms)	Mandatory				
<b>OBE-BSM029 Heading DE Value Error Tolerance (&lt;2° when &gt;12.5m/s)</b>	Mandatory				
<b>OBE-BSM030 Heading DE Value Latching (&lt;0.56 m/sec)</b>	Mandatory				
<b>OBE-BSM031 Heading DE Value Unlatching (&gt;0.83 m/sec)</b>	Mandatory				
OBE-BSM032 Longitudinal Acceleration DE Value Accuracy (<0.1m/s <sup>2</sup> )	Mandatory				
OBE-BSM033 Longitudinal Acceleration DE Value Latency (<220 ms)	Mandatory				
<b>OBE-BSM034 EventFlag DF Persistence per BSM Part II</b>	Mandatory				
<b>OBE-BSM035 EventFlag DF HardBraking Event Flag (&gt;0.4G / 4 m/s<sup>2</sup> in &gt;400 ms)</b>	Mandatory (Revised)				
OBE-BSM036 EventFlag DF HardBraking Event Flag Latency (<220ms)	Mandatory				
<b>OBE-BSM037 PathHistory DF PathHistoryPointSets-04</b>	Mandatory				
<b>OBE-BSM038 PathHistory Distance (&gt;300m)</b>	Mandatory				
<b>OBE-BSM039 PathHistory ⊥ Distance Difference (&lt;1m)</b>	Mandatory				
OBE-BSM040 PathHistory Data Source	Mandatory				
OBE-BSM041 PathHistory Conciseness	Mandatory				
OBE-BSM042 PathHistory Point Order	Mandatory				
OBE-BSM043 PathHistory Point Maximum Count (<23)	Mandatory				
OBE-BSM044 PathPrediction DF Values (<0.5 deg/sec)	Optional				
OBE-BSM045 PathPrediction DF Confidence (None=0)	Optional				
OBE-BSM046 PathPrediction DF Error Tolerance	Optional				
<b>OBE-BSM048 Yaw Rate DE Value Unavailability (32767)</b>	Mandatory				
OBE-BSM049 Yaw Rate Noise DE Value (<0.5°/s at one sigma)	Mandatory				
OBE-BSM050 Yaw Rate Bias DE Value (<0.3°/s)	Mandatory				

Requirement	Status	Verified	How		Comments
		Yes/No/ Missing	Report	Visual / Test	
OBE-BSM051 Yaw Rate Latency DE Value (<220ms)	Mandatory				
OBE-BSM052 PathPrediction Maximum Allowable Error Bound (<2% radius b/w 100m-2500m)	Mandatory				
OBE-BSM053 PathPrediction Recalculation Interval (<4 sec)	Mandatory				
OBE-BSM054 Vehicle Type Inclusion (if size set to unavailable)	Mandatory (Revised)				

INSPECTION & TEST REQUIREMENTS			
TC ID: B-1 Safety Pilot Procurement Requirements		Category: Bench Test	
STEP	TEST DESCRIPTION	Pass / Fail	Certification [Yes/No]
1	Does UUT meet USDOT “System Requirement Description 5.9GHz DSRC Vehicle Awareness Device Specification” version 3.6 dated 20120125? (RFP R-012512-1 Sec 4.6)		Yes
2	Does UUT display a human readable unique serial number for configuration management purposes? (RFP R-012512-1 Sec 4.6A)		Yes
3	Does UUT’s serial number shall contain a one letter prefix (supplier code) that will be assigned by the Test Conductor? (RFP R-012512-1 Sec 4.6B)		Yes
4	Does UUT meet Antenna requirements for Light Vehicle? <ul style="list-style-type: none"> <li>No permanent modification.</li> <li>Survive 1 year in Michigan winter climate, carwashes &amp; normal uses.</li> <li>No exposed cables interior or exterior of vehicle.</li> <li>Mounting location does not obstruct the driver.</li> <li>Average cable length not to exceed 5m.</li> </ul> (RFP R-012512-1 Sec 4.6C.a)	NT	Provided No
5	Does UUT meet Antenna requirements for Heavy Truck & Transit? <ul style="list-style-type: none"> <li>No permanent modification.</li> <li>Survive 1 year in Michigan winter climate, carwashes &amp; normal uses.</li> <li>Exposed cables exterior of vehicle are permissible..</li> <li>Mounting location does not obstruct the driver.</li> <li>Average cable length not to exceed 5m.</li> </ul> (RFP R-012512-1 Sec 4.6C.b)	NT	No
6	Does UUT have indicator that allows operator to determine: <ul style="list-style-type: none"> <li>The device is powering up.</li> <li>The device has booted up and is running (actively transmitting).</li> <li>The device has successfully read the removable media.</li> </ul> (RFP R-012512-1 Sec 4.6D)		Yes
7	Does UUT create a new System Event Log (SEL) upon each insertion of removable media? (RFP R-012512-1 Sec 4.6E.a)		Yes
8	Does UUT name the SEL uniquely as: A_B_C where: A = Device ID Number, unique to each unit (serial number) B = Configuration ID number or name C = UTC Timestamp. (RFP R-012512-1 Sec 4.6E.b)		Yes
9	Does UUT store each record shall contain an event type: <ul style="list-style-type: none"> <li>State Transition (ST) Event</li> <li>Removable Media (RM) Event</li> <li>Configuration Load (CL) Event</li> </ul> (RFP R-012512-1 Sec 4.6E.c)		Yes

10	Does UUT have each event record shall contain details of the event, specific to the event type? (RFP R-012512-1 Sec 4.6E.d)		Yes																																																												
11	Does UUT ensure that each event record has a UTC timestamp? (RFP R-012512-1 Sec 4.6E.e)		Yes																																																												
12	Power on the UUT, perform several ignition on/ignition off cycles. Perform several power off/power on cycles. Does UUT provide similar “Sample SEL Content” like: <table><tr><td>RM,</td><td>Mounted,</td><td>2012-05-06T05:13:10Z</td></tr><tr><td>CL,</td><td>Successful,</td><td>2012-05-06T05:13:11Z</td></tr><tr><td>ST,</td><td>Run,</td><td>2012-05-06T05:15:20Z</td></tr><tr><td>ST,</td><td>Quiet,</td><td>2012-05-06T05:34:11Z</td></tr><tr><td>ST,</td><td>Run,</td><td>2012-05-07T09:13:10Z</td></tr><tr><td>ST,</td><td>Quiet,</td><td>2012-05-07T09:13:41Z</td></tr><tr><td>ST,</td><td>Run,</td><td>2012-05-07T13:01:32Z</td></tr><tr><td>ST,</td><td>Quiet,</td><td>2012-05-07T13:08:12Z</td></tr><tr><td>ST,</td><td>Run,</td><td>2012-05-07T13:10:17Z</td></tr><tr><td>ST,</td><td>Quiet,</td><td>2012-05-07T14:55:33Z</td></tr><tr><td>ST,</td><td>Run,</td><td>2012-05-07T22:01:11Z</td></tr><tr><td>ST,</td><td>Quiet,</td><td>2012-05-07T22:09:02Z</td></tr><tr><td>ST,</td><td>Run,</td><td>2012-05-08T06:23:26Z</td></tr><tr><td>ST,</td><td>Quiet,</td><td>2012-05-08T06:33:19Z</td></tr><tr><td>ST,</td><td>Halt,</td><td>2012-05-08T06:33:54Z</td></tr><tr><td>RM,</td><td>Unmounted,</td><td>2012-05-08T06:33:56Z</td></tr><tr><td>RM,</td><td>Mounted,</td><td>2012-05-08T06:35:06Z</td></tr><tr><td>CL,</td><td>LoadFailed,</td><td>2012-05-08T06:35:10Z</td></tr><tr><td>ST,</td><td>Halt,</td><td>2012-05-08T06:35:22Z</td></tr><tr><td>RM,</td><td>Unmounted,</td><td>2012-05-08T06:35:58Z</td></tr></table> (RFP R-012512-1 Sec 4.6E.f)	RM,	Mounted,	2012-05-06T05:13:10Z	CL,	Successful,	2012-05-06T05:13:11Z	ST,	Run,	2012-05-06T05:15:20Z	ST,	Quiet,	2012-05-06T05:34:11Z	ST,	Run,	2012-05-07T09:13:10Z	ST,	Quiet,	2012-05-07T09:13:41Z	ST,	Run,	2012-05-07T13:01:32Z	ST,	Quiet,	2012-05-07T13:08:12Z	ST,	Run,	2012-05-07T13:10:17Z	ST,	Quiet,	2012-05-07T14:55:33Z	ST,	Run,	2012-05-07T22:01:11Z	ST,	Quiet,	2012-05-07T22:09:02Z	ST,	Run,	2012-05-08T06:23:26Z	ST,	Quiet,	2012-05-08T06:33:19Z	ST,	Halt,	2012-05-08T06:33:54Z	RM,	Unmounted,	2012-05-08T06:33:56Z	RM,	Mounted,	2012-05-08T06:35:06Z	CL,	LoadFailed,	2012-05-08T06:35:10Z	ST,	Halt,	2012-05-08T06:35:22Z	RM,	Unmounted,	2012-05-08T06:35:58Z		Yes
RM,	Mounted,	2012-05-06T05:13:10Z																																																													
CL,	Successful,	2012-05-06T05:13:11Z																																																													
ST,	Run,	2012-05-06T05:15:20Z																																																													
ST,	Quiet,	2012-05-06T05:34:11Z																																																													
ST,	Run,	2012-05-07T09:13:10Z																																																													
ST,	Quiet,	2012-05-07T09:13:41Z																																																													
ST,	Run,	2012-05-07T13:01:32Z																																																													
ST,	Quiet,	2012-05-07T13:08:12Z																																																													
ST,	Run,	2012-05-07T13:10:17Z																																																													
ST,	Quiet,	2012-05-07T14:55:33Z																																																													
ST,	Run,	2012-05-07T22:01:11Z																																																													
ST,	Quiet,	2012-05-07T22:09:02Z																																																													
ST,	Run,	2012-05-08T06:23:26Z																																																													
ST,	Quiet,	2012-05-08T06:33:19Z																																																													
ST,	Halt,	2012-05-08T06:33:54Z																																																													
RM,	Unmounted,	2012-05-08T06:33:56Z																																																													
RM,	Mounted,	2012-05-08T06:35:06Z																																																													
CL,	LoadFailed,	2012-05-08T06:35:10Z																																																													
ST,	Halt,	2012-05-08T06:35:22Z																																																													
RM,	Unmounted,	2012-05-08T06:35:58Z																																																													
13	Does UUT store S/W, Firmware & H/W versions on removable media? (RFP R-012512-1 Sec 4.6F)		Yes																																																												
14	Does UUT operate “out of the box?” (RFP R-012512-1 Sec 4.6G)		Yes																																																												
15	Does UUT exclude “External On/Off” switches (prohibited)? (RFP R-012512-1 Sec 4.6H)		Yes																																																												
16	Does UUT contain Security Credentials to support DSRC communications for a 2 month period without requiring a refresh? (RFP R-012512-1 Sec 4.6I.a)		Yes																																																												
17	Does UUT have the ability to set a static MAC Address for Interoperability Testing? (RFP R-012512-1 Sec 4.6I.b)		Yes																																																												
18	Is UUT complaint to ISO 26262 "Road vehicles -- Functional safety, adaptation of IEC 61508 for Automotive Electric/Electronic Systems?" (Verification of Manufacturer’s Self Test Report) (RFP R-012512-1 Sec 4.6J)		Yes																																																												
Observations:																																																															
DATE: Month 2012		TESTER: OmniAir	UUT Model & Serial No.:																																																												

## BENCH TESTING:

TEST REQUIREMENTS					
TC ID: B-2 Voltage/Current during Transition States				Category: Bench Test	
STEP	TEST DESCRIPTION				
Record	Use Reference GPS unit and record the following: Longitude: °                                  Latitude: °                                  Altitude: m				
Setup	Setup & Run WireShark Packet Sniffer Test Tool w/ <b>GPS Synchronization</b> on appropriate transmit channel (Ch172) for data logging (PCAP). Also, run packet sniffer on adjacent channel (CH174) to verify transmissions being not received other than attended channel(s). Setup spectrum analysis if available to verify and record (picture) channel / wave form /power level. Verify that signal is not being clipped.				
Setup	Connect UUT with Delphi Connector & both DSRC RF & GPS Antennas to a variable DC power source and current meter. Test UUT in default configuration state received.				
Run 1	Set DC power source to 12 VDC (nominal). Verify that UUT is in the OPERATE state by observing that packets are being sent for 30 seconds minimum period. Valid packet per start-up (Security Enabled / Power (< Mask C limits) / Channel (172) / Data Rate (6Mbps) / TR 10Hz / PSID#32) was sent: <b>Yes/No</b> If No per start-up requirements, record configuration parameters and reconfigured device to desired parameters and retest. Valid packet per start-up parameters & format was sent: <b>Yes/No</b> Record Current: <b>0.000A / 0.000A</b> MAC Address: <b>###:###:###:###:## / ##:###:###:###:##</b>				
Run 2	Set DC power source to 9 VDC. Verify that a valid packet was sent for 30 seconds minimum period: <b>Yes/No</b> Record Current during transmissions: <b>0.000A / 0.000A</b>				
Run 3	Set DC power source to 16 VDC. Verify that a valid packet was sent for 30 seconds minimum period: <b>Yes/No</b> Record Current during transmissions: <b>0.000A // 0.000A</b>				
Run 4	Configure UUT to transition from OPERATE to QUIET (ignition off) where DC power source reset to 12 VDC (nominal). Record Time taken to transition from OPERATE to QUIET when packets stop transmitting: <b>## / ## seconds.</b> Record the Current in QUIET: <b>0.000A / 0.000A</b>				
Run 5	Configure UUT to transition from QUIET to OPERATE. What Time did UUT start re-transmitting: <b>## / ## seconds.</b> Record Current value in OPERATE: <b>0.000A / 0.000A</b>				
Run 6	Disconnect <b>all</b> power to UUT from OPERATE to NO POWER and verify that no packets are being sent. Reapply 12 VDC.  What Time did it take for UUT stop transmitting packets: <b>## / ## seconds</b> Record MAC Address: <b>###:###:###:###:## / ##:###:###:###:##</b>				
Run 7	Disconnect ignition power to UUT and verify that no packets are being sent. Reapply ignition power.                                  What Time did it take for UUT start transmitting packets: <b>## / ## seconds</b> What Time did it take for UUT start transmitting with valid GPS values: <b>## / ## seconds</b> Record MAC Address: <b>###:###:###:###:## / ##:###:###:###:##</b>				

		Pass / Fail	Certification [Yes/No]
8	Did UUT operate at the configuration default parameters (Run 1)? (OBE-OMC-015 Configuration Parameters)		Yes
9	Is a valid packet received every time the voltage (@+9V & +16V) was changed (Run 2 & 3)? (OBE-SYS006 Device Power Source)		Yes
10	Is the measured current (Runs 1 & 5) less than 1A? (OBE-SYS007 Maximum Operating Current)		Yes
11	Did UUT @12V (Runs 1, 4 & 7) start transmitting packets? (OBE-OMC001 State Transition – Initial to Operate)		Yes
12	Is the current draw recorded (Run 4) less than or equal to 1 mA? (OBE-SYS008 Maximum Standby Current)		Yes
13	Is the device shutdown transition time recorded (Run 4) less than 15 seconds? (OBE-OMC010 Device Shutdown)		Yes
14	After reconnecting at 12V (Run 5), did UUT start transmitting packets (I->O)? (OBE-OMC001 State Transition–Initial to Operate)		Yes
15	Did UUT device start within 10 seconds sending valid packets with GPS values? (OBE-OMC011 Device Start-up Time)		Yes
16	Did UUT transition from O->Q (Run 4) shown by cessation of packets? (OBE-OMC002 State Transition –Operate to Quiet)		Yes
17	Did UUT transition from Q->O (Run 5)? (OBE-OMC006 State Transition – Quiet to Operate)		Yes
18	Did UUT transition from NP->O (Run 6)? (OBE-OMC007 State Transition - No Power to Operate)		Yes
19	Did UUT implement IPv4 or IPv6 protocol and their security? (OBE-COM001 Protocol Support & OBE-COM002 Secure)		Yes
20	Reverse polarity of the leads (Run 6) and did UUT transition from NP->O? * <i>Be Cautious/Last Test Performed!</i> * (OBE-SYS015 Reversed Battery Leads & OBE-OMC007 State Transition - No Power to Operate)		Yes
21	Did UUT pass conducted power leads transient immunity per SAE J1113-11? (OBE-SYS014 Conducted Power Leads Transient)		Yes
	Complete other appropriate bench tests before starting item 22.		
Run 22	Start power cycling per UUT's default profile at 12V. Capture and log transmissions in PCAP files from UUT and Over-the-Air recording tool. 24 hour profile (hours): 0.5 On/0.5 Off, 1.0 On/1.0 Off, 2.0 On/1.0 Off, 0.5 On/0.5 Off & 4.0 On/1.0 Off. (OBE-SYS004 Transmitter Failure Indicator & OBE_SYS005 MTBF)		Yes
<b>Observations:</b>			
• [#]			
<b>Temperature:</b> ##°F		<b>Humidity:</b> ###%	
<b>DATE:</b> Month 2012	<b>TESTER:</b>	<b>UUT Model &amp; Serial No.:</b>	






UUT #	Date / Time	On	Off

UUT #	Date / Time	On	Off

Figure 1 – GAP Analysis of Power Cycling Test



TEST REQUIREMENTS			
TC ID: B-3 Transmitted Message Log			Category: Bench Test
STEP	TEST DESCRIPTION		
Setup	Setup and Run WireShark Packet Sniffer Test Tool w/GPS Synchronization on appropriate channel (CH172) for data logging (PCAP). Connect UUT device to the computer interface per its user manual.		
Run	Recycle 12V power to UUT and verify that packets are being sent over CH172. Save UUT & Over-the-Air PCAP files. Decode each packet sizes. Configure system message log size of UUT to something that is manageable for testing (ex. 1 MB). Verify that once that limit is reached the log file is closed. Use screen shots to show files formatting for following steps.		
		Pass / Fail	Certification [Yes/No]
1	Did UUT log files indicate UTC time stamp from system clock with synchronized GPS source for each frame logged? (VAD-TML002 Timestamp, OBE-POS006 Timing Source & OBE-POS007 UTC)		Yes
2	Was UUT able to put in HALT state and able to complete secure access (password) through LSI for configuration review? (OBE-INT003, OMC003 & OMC015, VAD-TML010)		Yes
3	Did UUT accept configuration file upload and validate any parameter change through LSI? (OBE-OMC016, OMC017 & OMC018)		Yes
4	Did UUT create TML files with unique file names consisting of UTC date-stamp & sequence number? (VAD-TML001, VAD-TML006 & VAD-TML007)		Yes
5	Did UUT store all transmitted 802.11p frames in dedicated TML files? Compare UUT file versus Over-the-Air PSTT Capture file. (VAD-TML013 802.11p Frames)		Yes
6	Are the log files created locally on the UUT accessible (password) and have 4 GB storage? (VAD-TML010 Log Access & TML015 Storage)		Yes
7	Are the TML log files able to be transferred to a remote system and PCAP 4.1.2 formatted? (VAD-TML011 Log Upload & TML014 PCAP)		Yes
Observations:			
Temperature: ##°F		Humidity: ##%	
DATE: Month 2012	TESTER: OmniAir	UUT Model & Serial No.:	

Name	Date modified	Type	Size
 Documents	7/22/2011 3:38 PM	Library	3 KB
 Music	9/18/2011 2:11 PM	Library	4 KB
 New Library	1/30/2012 5:14 PM	Library	1 KB
 Pictures	7/20/2011 5:29 PM	Library	4 KB
 Videos	7/20/2011 5:29 PM	Library	4 KB

**Figure 2 - UUT's File System showing Log Files Naming Uniqueness & Date-Stamp**

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
-----	------	--------	----------	--------	---------	------------------------

**Figure 3 Packet Decoding from UUT's PCAP File showing Certificates (Security Enabled) & J2735 BSM Part I & II Blob**

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
-----	------	--------	----------	--------	---------	------------------------

**Figure 4 Packet Decoding from UUT's PCAP File showing Certificate Digest, Decoding Layers & J2735 Part I & II Blob Decoding**

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
-----	------	--------	----------	--------	---------	------------------------

**Figure 5 Over-the-Air Packet Capture Decoding showing Certificates (Security Enabled) & J2735 BSM Part I & II Blob**

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
-----	------	--------	----------	--------	---------	------------------------

**Figure 6 Over-the-Air Packet Capture Decoding showing Certificates Digest (Security Enabled) & J2735 BSM Part I & II Blob**

```

***** OmniAir BSM Console Analyzer *****
802.11p dest mac: packet count:
802.11p src mac: packet size:
802.11p ethertype: orig size:
1609.3 wsmv ver: utc time:
1609.3 psid: num except: 0
1609.3 transmit power: last except:
1609.3 data rate: except frame: 0
1609.3 channel:
1609.3 wave element id:
1609.3 wsm size:
1609.3 wsmv-s control:
1609.2 header:
J2735 dsnc msg id:
J2735 blob size:
J2735 blob:

J2735 msgCnt:
J2735 id:
J2735 secMark:
J2735 lat:
J2735 lon:
J2735 elev:
J2735 pos accuracy:
J2735 trans & speed:
J2735 heading:
J2735 steering angle:
J2735 accel long:
J2735 accel lat:
J2735 accel vert:
J2735 yaw rate:
J2735 brake status:
J2735 vehicle size:
J2735 part 2:

1609.2 time/conf/sig:

entire frame: not shown_

```

Figure 7 - BSM PCAP Recorder & Playback Tool showing Certificate

```

***** OmniAir BSM Console Analyzer *****
802.11p dest mac: packet count:
802.11p src mac: packet size:
802.11p ethertype: orig size:
1609.3 wsmv ver: utc time:
1609.3 psid: num except: 0
1609.3 transmit power: last except:
1609.3 data rate: except frame: 0
1609.3 channel:
1609.3 wave element id:
1609.3 wsm size:
1609.3 wsmv-s control:
1609.2 header:
J2735 dsnc msg id:
J2735 blob size:
J2735 blob:

J2735 msgCnt:
J2735 id:
J2735 secMark:
J2735 lat:
J2735 lon:
J2735 elev:
J2735 pos accuracy:
J2735 trans & speed:
J2735 heading:
J2735 steering angle:
J2735 accel long:
J2735 accel lat:
J2735 accel vert:
J2735 yaw rate:
J2735 brake status:
J2735 vehicle size:
J2735 part 2:

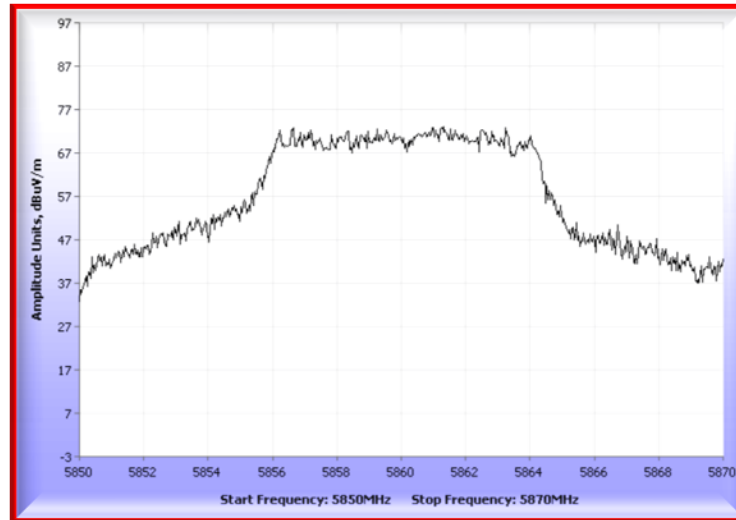
1609.2 time/conf/sig:

entire frame: not shown_

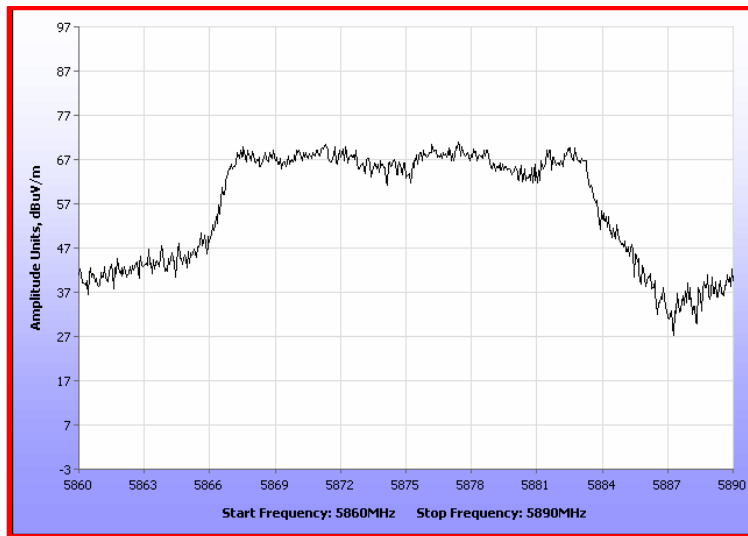
```

Figure 8 - BSM PCAP Recorder & Playback Tool showing Certificate Digest

TEST REQUIREMENTS			
TC ID: B-4 802.11p Conformance		Category: Bench Test	
STEP	TEST DESCRIPTION		
Setup	Setup and Run WireShark Packet Sniffer Test Tools <b>w/GPS Synchronization</b> on appropriate and adjacent channels for data logging (PCAP). Also, spectrum analysis capture to record channels seen. Record any anomalies.		
Run 1	Apply 12 V power to UUT device in both security Disabled / Enabled states. Configure UUT device to transmit seven 10 MHz (class 17) channels at default power level and data rate (6Mb/s). Verify that packets are being sent.		
Run 2	Configure UUT device to transmit two 20 MHz (class 18) channels. Verify that packets are being sent.		
		Pass / Fail	Certification [Yes/No]
3	Define number of simultaneous radio channels can operate at 5.9 GHz DSRC? ## (VAD-DRS001 DSRC Radios (one))		Yes
4	Does the UUT transmit on seven even 10 MHz channels in the range 172 to 184? (OBE-DRS012 Class 17 – 10MHz Channels)		Yes
5	Does IEEE 1609.2 Security state (Enabled or Disabled) affect the channel parameters?		Yes
6	Does the UUT device transmit on odd 20 MHz channels (175 & 181)? (OBE-DRS013 Class 18 – 20 MHz Channels)		Yes
7	Does the UUT device operate with OFDM modulation? *PSTT will not decode unless OFDM is used * (OBE-DRS004 Modulation-OFDM)		Yes
8	Does the UUT device transmit Quality of Service (QoS) data frames? (OBE-DRS006 QoS Data Frames)		Yes
9	Does the UUT device have a <u>configurable</u> EDCA parameter set by examining configuration file during HALT state? (OBE-DRS014 Enhanced Distributed Channel Access)		Yes
<b>Observations:</b> • [#]			
Temperature: ##°F		Humidity: ##%	
DATE: Month 2012	TESTER: OmniAir	UUT Model & Serial No.:	



**Figure 9 - Spectrum Analyzer Over-the-Air 10 MHz Channel Capture (CH172 or 178)**



**Figure 10 - Spectrum Analyzer Over-the-Air 20 MHz Channel Capture (CH175 or 181)**

[Insert Configuration Parameters Screen Shot including EDCA]

**Figure 11 - Configuration Parameters from UUT**

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
<div> <div></div> <div></div> </div>						

**Figure 12 Packet Decoding from UUT's PCAP File with Security Disabled**

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
<div> <div></div> <div></div> </div>						

**Figure 13 Over-the-Air Packet Decoding with Security Disabled**



No.	PSID	SSI Signal (dBm)	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
-----	------	------------------	------	--------	----------	--------	---------	------------------------

**Figure 14 BSM PCAP Capturing on 20 MHz Channel (CH175 or 181)**

TEST REQUIREMENTS			
TC ID: B-5 1609.2 Compliance			Category: Bench Test
STEP	TEST DESCRIPTION		
Setup	Use WireShark Packet Sniffer w/GPS Synchronization to capture and log transmissions (PCAP) and analyse to answer following questions (save data).		
Run	Apply 12V power to UUT device with DSRC RF & GPS antennas and security enabled to capture BSMs or analyze previous PCAP file.		
		Pass / Fail	Certification [Yes/No]
1	Does UUT comply to Security Profile per Appendix C? BSMs with Certificate (0x02). (OBE-DRS017 Security Profile)		Yes
2	Is the UUT device capable of loading and storing >211,000 certificates? Record Memory Size Availability: ## GB. Record time takes to load # certificates: ## / ## minutes Analyze for any expired and when latest certificates will expire: (VAD-DRS002 Certificates Loading & Storage)		Yes
3	Can Certificates be deleted from UUT through LSI authorized secured entry when in HALT state? (OBE-DRS020 Certificate Deletion)		Yes
4	Can the UUT device support time-limited certificates (5 minutes with 30 seconds overlap duration for Safety Pilot) with a start & end time? (OBE-DRS018 Time-Limited Certificates)		Yes
5	Is the UUT device capable of signing “all” outbound BSM using 1609.2 certificates as defined in IEEE 1609.2, Draft 9? (OBE-DRS016 Signing)		Yes
6	Does the BSM use ECDSA-256 bit keys for signing outbound BSM? (OBE-DRS017 Security Profile & Appendix-C)		Yes
7	Does the UUT device randomize the DSRC radio’s MAC address, Digest, & Temporary ID upon a change in 1609.2 certificate? Run for 15 minutes to see two certification changes (5 minute durations). Results can be seen in later Vehicle Rotation Test (SV-1). (OBE-DRS022 Randomize MAC Address on Certificate Change)		Yes
8	Did the UUT device comply with IEEE 1609.2, Draft 9.3 based on results above? Security will be disabled if D9 is not implemented. (OBE-DRS016 Conformance)		Yes
Observations:			
• [#]			
Temperature ##°F		Humidity: ##%	
DATE: Month 2012	TESTER: OmniAir	UUT Model & Serial No.:	

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
4	2012-01-17 13:25:41.417789	c2:e5:31:8d:55:5f	70	170	45800	certificate_digest_with_ecdsap256
5	2012-01-17 13:25:41.517241	c2:e5:31:8d:55:5f	71	241	46000	certificate

<p>Frame 5: 241 bytes on wire (1928 bits), 241 bytes captured (1928 bits)</p> <p>IEEE 802.3 Ethernet</p> <p>Logical-Link Control</p> <p>WSMP IEEE 1609.3r2010 PSID: (32) (Channel: 172) (Data Rate: 6 Mb/s) (TX P)</p> <p>BSM SAE J2735r200911</p> <p>IEEE 1609.2 D9</p> <p>Version: 2</p> <p>Content Type: signed (1)</p> <p>Signer Identifier Type: certificate (3)</p> <p>Certificate: 03000342076716e8a56d3c0112aaaaaaabbbbbbcccccc...</p> <p>Message Flag: 0x02</p> <p>....0 = fragment_not_supported: False</p> <p>....1 = use_generation_time: True</p> <p>....0 = expires: False</p> <p>....0 = use_location: False</p> <p>....0 = extension_field: False</p> <p>PSID: 32</p> <p>Length: 45</p> <p>Certificate Info</p> <p>Signer</p> <p>Signature</p> <p>BasicSafetyMessage</p>	<pre> 0000 ff ff ff ff ff ff c2 e5 31 8d 55 5f 00 e3 aa aa 0010 03 00 00 00 88 dc 02 20 0f 01 ac 10 01 0c 04 01 0020 14 81 00 cd 01 02 01 03 03 00 03 42 07 67 16 e8 0030 a5 6d 3c 01 12 aa aa aa aa bb bb bb bb cc cc cc 0040 cc cc cc cc cc cc cc 01 02 20 00 04 0f 22 69 34 0050 01 4a 00 00 00 01 02 15 d8 90 0d b8 ef 31 d4 96 0060 11 d8 4a ba 21 c2 ee b0 fa e3 3d 03 35 a6 2e d0 0070 50 0a e0 7c 8c 6d 6f 02 20 2d 30 2b 80 01 02 81 0080 26 47 32 f4 c8 11 b3 b0 17 64 68 a5 d2 52 c9 cb 0090 ff f0 ff ff ff ff e0 11 00 00 7f 07 d1 07 d1 81 00a0 7f ff 08 00 32 01 f4 00 00 e6 ee c0 da 8d 4f 0e 00b0 03 77 4b 0d e8 2d 08 c4 45 e0 66 08 fa ad 6a 67 00c0 37 0b f2 a0 fc 0b 84 5d 84 f3 26 72 f6 cf 31 e3 00d0 5f 61 fd 34 3b 8d c4 1d 17 4b 2a 65 4b 57 21 38 00e0 08 0a fd a0 49 fd 82 96 62 0e 36 96 9e a7 11 78 00f0 d2 </pre>
--	---

Figure 15 Over-the-Air Signed Packet with Security Enabled showing 1609.2 Certificate & its Decoding

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
4	2012-01-17 13:25:41.417789	c2:e5:31:8d:55:5f	70	170	45800	certificate_digest_with_ecdsap256
5	2012-01-17 13:25:41.517241	c2:e5:31:8d:55:5f	71	241	46000	certificate

<p>Frame 4: 170 bytes on wire (1360 bits), 170 bytes captured (1360 bits)</p> <p>IEEE 802.3 Ethernet</p> <p>Logical-Link Control</p> <p>WSMP IEEE 1609.3r2010 PSID: (32) (Channel: 172) (Data Rate: 6 Mb/s) (TX P)</p> <p>BSM SAE J2735r200911</p> <p>IEEE 1609.2 D9</p> <p>Version: 2</p> <p>Content Type: signed (1)</p> <p>Signer Identifier Type: certificate_digest_with_ecdsap256 (2)</p> <p>Digest Value: 7cccdbe75e5a3a2</p> <p>Message Flag: 0x02</p> <p>....0 = fragment_not_supported: False</p> <p>....1 = use_generation_time: True</p> <p>....0 = expires: False</p> <p>....0 = use_location: False</p> <p>....0 = extension_field: False</p> <p>PSID: 32</p> <p>Length: 45</p> <p>Certificate Info</p> <p>Signer</p> <p>Signature</p> <p>BasicSafetyMessage</p>	<pre> 0000 ff ff ff ff ff ff c2 e5 31 8d 55 5f 00 9c aa aa 0010 03 00 00 00 88 dc 02 20 0f 01 ac 10 01 0c 04 01 0020 14 81 00 86 01 02 01 02 7c cc ed be 75 e5 a3 82 0030 02 20 2d 30 2b 80 01 02 81 26 46 32 f4 e8 11 b2 0040 e8 17 64 68 a0 d2 52 c9 d0 ff f1 ff ff ff ff e0 0050 11 00 00 7f 07 d1 07 d1 81 7f ff 08 00 32 01 f4 0060 00 00 e6 ee c0 d9 06 cd 0e 03 57 9d 57 b9 a5 d8 0070 b0 d6 4b e3 39 f1 f1 c5 64 b6 b3 94 1c 69 8a 62 0080 eb 85 92 43 4b f6 de b9 20 23 e6 99 8e a7 d8 79 0090 27 02 e3 dd d2 ae 13 d6 bd bc c1 24 39 dc 72 ee 00a0 d0 73 80 d5 9d 93 8e 79 40 57 </pre>
--	---

Figure 16 Over-the-Air Signed Packet with Security Enabled showing 1609.2 Certificate Digest, 256 bit Key Identification & its Decoding

```

Results:
Total packets: ###
1609.2 Extraction from packet:
| success ( ) | (100.000000 %)
1609.2 Message Parse result:
- with parser library:
| PARSE_SUCCESS ( ) | (100.000000 %)
- with Aerolink:
| no error ( ) | (100.000000 %)
Aerolink Validation Result:
| no error ( ) | (100.0 %)
| ws err no certificate for message ( ) | (0.0 %)
Security Profile Conformance:
Generation Time (should be included)
* | included | (100.000000 %)
Generation Location (should be omitted)
* | omitted | (100.000000 %)
Expiry Time (should be omitted)
* | omitted | (100.000000 %)
Fast Verify Info in Signatures (should be included)
* | included | (100.000000 %)
SignerIdentifierType (should be one of the following:
- CERTIFICATE_DIGEST_WITH_ECDSA_P256 or CERTIFICATE
* | CERTIFICATE_DIGEST_WITH_ECDSA_P256( 2) | (80.000000 %)
* | CERTIFICATE( 3) | (20.000000 %)
Cert version and type (should be 3)
* | implicit( 3) | (100.000000 %)
Cert subject type (should be ST_MESSAGE_ANONYMOUS)
* | ST_MESSAGE_ANONYMOUS( 0) | (100.000000 %)
Mean / std dev / max / min time between signed messages:
| 0.1 / 0.000133864 / 0.100332 / 0.099668
Mean / std dev / max / min time between signed messages with certs (mean 0.5s):
| 0.5 / 4.28597e-05 / 0.500086 / 0.499908

```

Figure 17 IEEE 1609.2 Security Analysis Summary

No.	Time	Source	Digest Value	TemporaryID	MsgCount	Length	DSecond	Signer Identifier Type
117	2012-02-21 18:05:00.421466	42:6b:8a:ed:4f:a9	d83ed946a62eef59	0x17a355a6	122	377	500	certificate
118	2012-02-21 18:05:00.520924	42:6b:8a:ed:4f:a9	d83ed946a62eef59	0x17a355a6	123	306	600	certificate_digest_with_ecdsap256
119	2012-02-21 18:05:00.620930	42:6b:8a:ed:4f:a9	d83ed946a62eef59	0x17a355a6	124	306	700	certificate_digest_with_ecdsap256
120	2012-02-21 18:05:00.720932	42:6b:8a:ed:4f:a9	d83ed946a62eef59	0x17a355a6	125	306	800	certificate_digest_with_ecdsap256
121	2012-02-21 18:05:00.820932	42:6b:8a:ed:4f:a9	d83ed946a62eef59	0x17a355a6	126	306	900	certificate_digest_with_ecdsap256
122	2012-02-21 18:05:00.923097	42:6b:8a:ed:4f:a9	d83ed946a62eef59	0x17a355a6	127	306	1000	certificate_digest_with_ecdsap256
123	2012-02-21 18:05:01.021415	42:6b:8a:ed:4f:a9		0x17a355a6	0	377	1100	certificate
124	2012-02-21 18:05:01.121441	2c:94:71:56:f5:4f		0x67e0bf71	63	377	1199	certificate
125	2012-02-21 18:05:01.220859	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	64	306	1300	certificate_digest_with_ecdsap256
126	2012-02-21 18:05:01.320834	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	65	306	1399	certificate_digest_with_ecdsap256
127	2012-02-21 18:05:01.420844	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	66	306	1500	certificate_digest_with_ecdsap256
128	2012-02-21 18:05:01.520845	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	67	306	1600	certificate_digest_with_ecdsap256
129	2012-02-21 18:05:01.620825	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	68	306	1700	certificate_digest_with_ecdsap256
130	2012-02-21 18:05:01.721352	2c:94:71:56:f5:4f		0x67e0bf71	69	377	1800	certificate
131	2012-02-21 18:05:01.820859	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	70	306	1800	certificate_digest_with_ecdsap256

No.	Time	Source	Digest Value	TemporaryID	MsgCount	Length	DSecond	Signer Identifier Type
1450	2012-02-21 18:10:00.709774	2c:94:71:56:f5:4f		0x67e0bf71	115	396	800	certificate
1451	2012-02-21 18:10:00.809356	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	116	325	900	certificate_digest_with_ecdsap256
1452	2012-02-21 18:10:00.909334	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	117	325	1000	certificate_digest_with_ecdsap256
1453	2012-02-21 18:10:01.009328	2c:94:71:56:f5:4f	94dd79fbf21974a3	0x67e0bf71	118	325	1100	certificate_digest_with_ecdsap256
1454	2012-02-21 18:10:01.109839	e0:2b:a6:d7:63:c6		0x3b3561f8	5	396	1199	certificate
1455	2012-02-21 18:10:01.209327	e0:2b:a6:d7:63:c6	a30cbae6d35f43eb	0x3b3561f8	6	325	1300	certificate_digest_with_ecdsap256
1456	2012-02-21 18:10:01.309350	e0:2b:a6:d7:63:c6	a30cbae6d35f43eb	0x3b3561f8	7	325	1399	certificate_digest_with_ecdsap256
1457	2012-02-21 18:10:01.409272	e0:2b:a6:d7:63:c6	a30cbae6d35f43eb	0x3b3561f8	8	325	1500	certificate_digest_with_ecdsap256
1458	2012-02-21 18:10:01.509267	e0:2b:a6:d7:63:c6	a30cbae6d35f43eb	0x3b3561f8	9	325	1600	certificate_digest_with_ecdsap256
1459	2012-02-21 18:10:01.609295	e0:2b:a6:d7:63:c6	a30cbae6d35f43eb	0x3b3561f8	10	325	1700	certificate_digest_with_ecdsap256
1460	2012-02-21 18:10:01.709781	e0:2b:a6:d7:63:c6		0x3b3561f8	11	396	1800	certificate

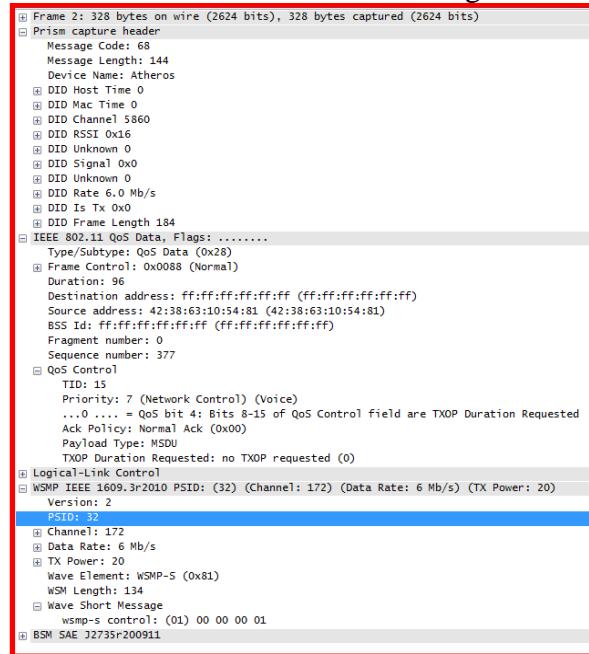
  

Frame 1454: 396 bytes on wire (3168 bits), 396 bytes captured (3168 bits)	0000	ff	ff	ff	ff	ff	ff	e0	2b	a6	d7	63	c6	01	7e	aa	aa
IEEE 802.3 Ethernet	0010	03	00	00	00	88	dc	02	20	10	01	0c	04	01	17	81	01
Logical-Link Control	0020	6b	01	02	01	03	00	00	03	42	07	67	16	e8	a5	6d	3c
WSMP IEEE 1609.3r2010 PSID: (32) (Data Rate: 6 Mb/s) (TX Power: 23)	0030	01	12	aa	aa	aa	bb	bb	bb	bb	cc	cc	cc	cc	cc	cc	cc
BSM SAE J2735r200911	0040	cc	cc	cc	cc	01	02	20	00	04	0f	50	7c	20	01	4a	00
IEEE 1609.2 D9	0050	00	00	01	02	07	3c	a4	5e	d6	10	63	e7	53	47	ec	a2
Version: 2	0060	e3	da	d3	26	71	1c	61	85	41	00	60	99	7b	da	1f	68
Content Type: signed (1)	0070	1f	3d	fe	ec	02	20	80	ca	30	81	c7	80	01	02	81	26
Signer Identifier Type: certificate (3)	0080	05	3b	35	61	f8	04	af	17	77	4b	9c	d3	43	44	35	00
Certificate: 03000342076716e8a56d3c0112aaaaaaabbbbbbbcccccc...	0090	c3	28	28	00	00	e0	01	0c	58	7f	00	00	00	00	81	00
Message Flag: 0x02	00a0	00	08	00	2e	42	03	a2	81	99	a1	81	8e	a3	81	8b	83
PSID: 32	00b0	81	88	00	2b	c0	0b	c0	01	20	62	00	00	40	09	40	03
Certificate Info	00c0	22	b0	00	50	40	06	ff	ef	80	3e	00	45	80	07	ff	ec
Signer	00d0	82	81	ff	a8	80	24	ff	e1	86	4c	00	39	80	01	ff	e2
Signature	00e0	ff	fe	00	28	40	0e	ff	e3	ff	fe	00	3c	40	40	ff	e2
BasicSafetyMessage	00f0	ff	fe	00	21	ff	ee	ff	ed	ff	fe	00	67	40	12	ff	ef
	0100	ff	fe	00	43	80	0d	ff	f3	ff	fe	00	56	40	0a	ff	f5
	0110	ff	fe	00	3e	c0	0c	ff	fc	ff	fe	00	5c	c0	0c	ff	ef
	0120	ff	fe	00	2b	c0	09	ff	d6	ff	fe	01	a6	40	7a	ff	dd
	0130	ff	fe	00	bd	00	13	ff	e3	ff	fe	a2	06	80	01	e8	81
	0140	01	14	00	00	e9	ad	c6	68	f5	39	15	02	3c	04	a4	ea
	0150	74	38	1e	51	01	68	51	30	1b	5a	43	32	5d	7f	0d	48
	0160	a6	b6	22	30	01	93	6a	b1	47	68	3d	36	cd	0e	0c	3d
	0170	0f	03	29	28	8f	78	76	ff	e7	7e	fa	19	b0	f7	93	1c
	0180	db	62	c2	79	b7	94	e7	f1	ee	ff	26	62				

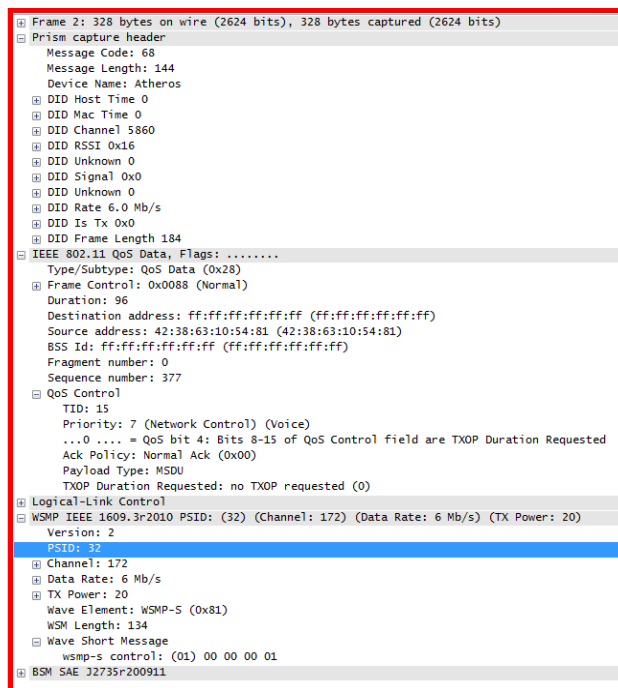
Figure 16 Certificate changes at 5' Time Interval with MAC Address & Digest Values, and TemporaryID Change

TEST REQUIREMENTS			
TC ID: B-6 1609.3 Compliance			Category: Bench Test
STEP	TEST DESCRIPTION		
Record	Use WireShark packet sniffer test tool w/GPS Synchronization to capture and log transmissions (PCAP) and analyze per previous or new captures.		
		Pass / Fail	Certification [Yes/No]
1	Did UUT send BSM within WAVE Short Messages Protocol (0x88dc)? (VAD-DRS005 WSMP & OBE-DRS025 Send BSM as WSMP)		Yes
2	Did UUT support the transmission of the WSMP safety supplement “0x81” specified in Annex G of IEEE1609.3:2010 with WSMP-S Control value (0x01)? If not, WSMP-S is 0x80. (OBE-DRS026 Safety Supplement & DRS027 WSMP-S Control)		Yes
3	Did UUT support different PSID values assigned to different message types (0x20 default for BSM) and a configurable User Priority value (configuration file, default to 2) to each data frame? (OBE-DRS028 PSID & Specific User Priority)		Yes
4	Did UUT support the following WSM header options as part of the configuration file: Channel Number (suggested), Data Rate and Transmit Power used? (OBE-DRS029 WSMP Header Options)		Yes
5	Was the transmit power configurable and changeable on any channel (Use CH172 or 178)?		Yes
6	Was the data rate (3 -27 Mbps) configurable and changeable on any channel (Use CH172 or 178)? (OBE-DRS003 Data Rates)		Yes
Observations: • [#]			
Temperature: ##°F		Humidity: ##%	
DATE: Month 2012	TESTER: OmniAir	UUT Model & Serial No.:	

## Insert both UUT & Over-the-Air Packet Decoding with Security Enabled



**Figure 18 - Over-the-Air Packet Sent / Receive Verification of IEEE 1609.3 Parameters Changes: Channel, Power, Data Rate & QoS Data Frames through RadioTap/PRISM Capture**



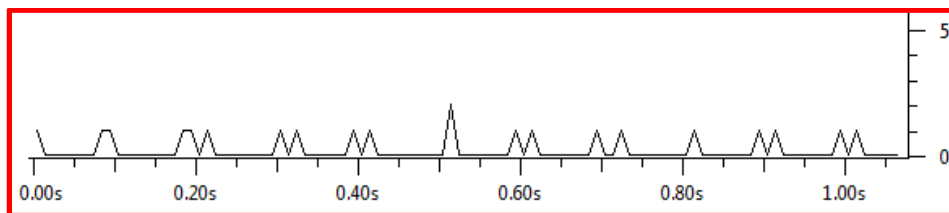
**Figure 19 Packet Decoding from UUT's PCAP File showing Over-the-Air Packet Sent / Receive Verification through RadioTap/PRISM Capture**

TEST REQUIREMENTS			
TC ID: B-7 1609.4 Compliance		Category: Bench Test	
STEP	TEST DESCRIPTION		
Setup	Use WireShark packet sniffer(s) <b>w/GPS Synchronization</b> on appropriate separate channels to capture and log transmissions and analyse results for:		
Run 1	Set control Ch172 at 20 Hz transmission rate and look for time gap in packets receive. Data may not be seen in Over-the-Air packet capture on chosen service channel.		
		Pass / Fail	Certification [Yes/No]
2	Is UUT capable of operating in either in a continuous or alternating mode as shown in IEEE 1609.4 with a default mode of continuous? (OBE-DRS033 Radio Operating Mode & OBE-DRS035 Alternating Channel Mode)		Yes
3	Does the UUT device <u>randomize</u> its MAC address upon power-up? Use previous testing accumulation for five times & MAC addresses recordings. (OBE-DRS037 Randomize MAC Address on Device Power Up)		Yes
Observations:			
Temperature: ##°F		Humidity: ##%	
DATE: Month 2012	TESTER: OmniAir	UUT Model & Serial No.:	

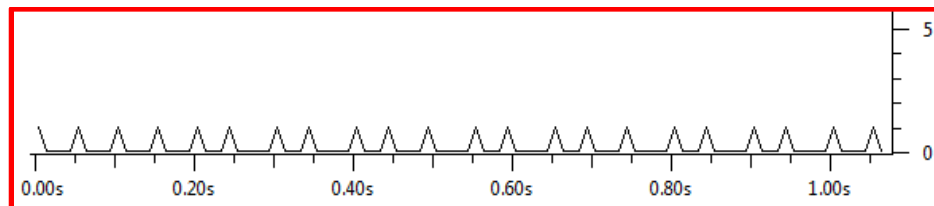


No.	Time	Source	Length	DSecond	Signer Identifier Type
3	2012-01-17 10:48:48.965242	9e:9a:1d:35:3c:34	170	49172	certificate_digest_with_ecdsap256
4	2012-01-17 10:48:49.051687	9e:9a:1d:35:3c:34	170	49238	certificate_digest_with_ecdsap256
5	2012-01-17 10:48:49.064248	9e:9a:1d:35:3c:34	170	49273	certificate_digest_with_ecdsap256
6	2012-01-17 10:48:49.082322	9e:9a:1d:35:3c:34	170	49313	certificate_digest_with_ecdsap256
7	2012-01-17 10:48:49.170273	9e:9a:1d:35:3c:34	170	49384	certificate_digest_with_ecdsap256
8	2012-01-17 10:48:49.190316	9e:9a:1d:35:3c:34	170	49432	certificate_digest_with_ecdsap256
9	2012-01-17 10:48:49.265304	9e:9a:1d:35:3c:34	170	49475	certificate_digest_with_ecdsap256
10	2012-01-17 10:48:49.279233	9e:9a:1d:35:3c:34	170	49507	certificate_digest_with_ecdsap256
11	2012-01-17 10:48:49.379392	9e:9a:1d:35:3c:34	170	49557	certificate_digest_with_ecdsap256
12	2012-01-17 10:48:49.383277	9e:9a:1d:35:3c:34	170	49599	certificate_digest_with_ecdsap256
13	2012-01-17 10:48:49.464383	9e:9a:1d:35:3c:34	241	49673	certificate
14	2012-01-17 10:48:49.486258	9e:9a:1d:35:3c:34	170	49723	certificate_digest_with_ecdsap256
15	2012-01-17 10:48:49.559306	9e:9a:1d:35:3c:34	170	49762	certificate_digest_with_ecdsap256
16	2012-01-17 10:48:49.590304	9e:9a:1d:35:3c:34	170	49800	certificate_digest_with_ecdsap256
17	2012-01-17 10:48:49.679287	9e:9a:1d:35:3c:34	170	49905	certificate_digest_with_ecdsap256
18	2012-01-17 10:48:49.768262	9e:9a:1d:35:3c:34	170	49981	certificate_digest_with_ecdsap256
19	2012-01-17 10:48:49.788309	9e:9a:1d:35:3c:34	170	50012	certificate_digest_with_ecdsap256
20	2012-01-17 10:48:49.862310	9e:9a:1d:35:3c:34	170	50067	certificate_digest_with_ecdsap256
21	2012-01-17 10:48:49.879328	9e:9a:1d:35:3c:34	213	50104	certificate_digest_with_ecdsap256
22	2012-01-17 10:48:49.964369	9e:9a:1d:35:3c:34	241	50172	certificate
23	2012-01-17 10:48:49.981293	9e:9a:1d:35:3c:34	170	50209	certificate_digest_with_ecdsap256
24	2012-01-17 10:48:50.057256	9e:9a:1d:35:3c:34	170	50255	certificate_digest_with_ecdsap256

**Figure 20 Over-the-Air Packet Capture set at 20 Hz Transmission Rate and seeing Alternating Channel Switching (varying 50ms intervals)**



**Figure 21 - Over-the-Air Packet Transmissions at 20 Hz and seeing Alternating Channel Switching Mode**



**Figure 22 -Over-the-Air Packet Transmissions at 20 Hz and seeing Continuous Channel Mode**

TEST REQUIREMENTS			
TC ID: B-8 Message Processing & Formatting			Category: Bench Test
STEP	TEST DESCRIPTION		
Setup & Run	Record UUT's packets capture through WireShark Packet Sniffer Test Tool <b>w/GPS Synchronization</b> and using suitable software decoders analyze the packets to verify the following:		
Setup	Populate length, width and type of vehicle in UUT's device configuration.		
		Pass / Fail	Certification [Yes/No]
1	Does the UUT device BSM message conform to J2735 2009-11 with ASN.1/blob decoding output? (OBE-MPS001 J2735 & OBE-BSM001 BSM)		Yes
2	Does the UUT device transmit generated BSM over the DSRC radio interface at its configured message rate? (OBE-BSM002 Transmission)		Yes
3	Is the UUT device BSM Part 1 transmission interval configurable within the range of 2 Hz to 20 Hz with a default value of 10 Hz? Test 2, 10 & 20 Hz. (OBE-BSM004 Part I Transmission Interval)		Yes
4	Does the UUT device transmit each of the required BSM Part II data frames and data elements with every Nth BSM Part I message with N being configurable with a default of 1 (40)? (OBE-BSM005 Part II Transmission Interval)		Yes
5	Does the BSM Part I at a minimum include all the data elements listed? <b>DSRCmsgID, MsgCount, TemporaryID, DSecond, Latitude, Longitude, Elevation, Positional Accuracy, Speed, Heading, Longitudinal Acceleration &amp; Yaw.</b> (OBE-BSM007 Part I Data Elements)		Yes
6	Does the BSM Part II include <u>all</u> the data elements listed? <b>Event Flags, PathHistory, PathPredication &amp; Vehicle Type</b> (OBE-BSM008 & BSM009 Part II Data Elements)		Yes
7	Do packets provide BSM Part I & II data? (OBE-BSM010 Part I & II)		Yes
8	Did UUT device (remove GPS antenna) use proper null value in transmitted message when it could not determine position? "Unavailable" values are: • Lat 900000001, Lon 1800000001 & Elev 61440 • Pos Accuracy 4294967295 (0xff ff ff ff), • Trans & Speed 61440 (0xff ff) • Heading 28800 (0x70 80) & Steering Angle 127 (unavailable= 0x7f ) • Acceleration Longitudinal 2001 (unavailable=0x07 d1) • Yaw Rate 32767 (0x7FFF) (OBE-POS004 Positioning Failure Handling (Null Value))		Yes
9	Was "vehicle type" populated in Part II? (OBE-BSM054 Vehicle Type Value Inclusion)		Yes
10	Does UUT device initialize and rotate MsgCount (0-127) in BSM? (OBE-BSM011 MsgCount)		Yes
11	Does UUT device initialize and rotate MsgCount (0-127) in BSM when sender changes identity by changing TemporaryID? (OBE-BSM012 Temporary ID Change)		Yes

12	Does UUT device change random non-predictable TemporaryID upon Certificate Change in BSM? (OBE-BSM013 & BSM014 Temporary ID Rotation on Certificate Change)		Yes
<b>Observations:</b>			
<b>Temperature:</b> ##°F		<b>Humidity:</b> ##%	
<b>DATE:</b> Month 2012	<b>TESTER:</b> OmniAir	<b>UUT Model &amp; Serial No.:</b>	

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
28	2012-01-16 16:22:15.629256	f6:d9:4d:29:a0:b0	22	265	65535	certificate
29	2012-01-16 16:22:16.128413	f6:d9:4d:29:a0:b0	23	241	65535	certificate
30	2012-01-16 16:22:16.628018	f6:d9:4d:29:a0:b0	24	265	65535	certificate
31	2012-01-16 16:22:17.128820	f6:d9:4d:29:a0:b0	25	241	65535	certificate
32	2012-01-16 16:22:17.628777	f6:d9:4d:29:a0:b0	26	265	65535	certificate
33	2012-01-16 16:22:18.128311	f6:d9:4d:29:a0:b0	27	241	65535	certificate
34	2012-01-16 16:22:18.628009	f6:d9:4d:29:a0:b0	28	265	65535	certificate
35	2012-01-16 16:22:19.128477	f6:d9:4d:29:a0:b0	29	241	65535	certificate
36	2012-01-16 16:22:19.628725	f6:d9:4d:29:a0:b0	30	265	65535	certificate
37	2012-01-16 16:22:20.127815	f6:d9:4d:29:a0:b0	31	241	65535	certificate
38	2012-01-16 16:22:20.628309	f6:d9:4d:29:a0:b0	32	265	65535	certificate

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
3	2012-01-16 09:55:20.949267	4a:a1:d4:27:86:32	61	170	21072	certificate_digest_with_ecdsap256
4	2012-01-16 09:55:21.050089	4a:a1:d4:27:86:32	62	366	21173	certificate
5	2012-01-16 09:55:21.149319	4a:a1:d4:27:86:32	63	170	21272	certificate_digest_with_ecdsap256
6	2012-01-16 09:55:21.249201	4a:a1:d4:27:86:32	64	170	21372	certificate_digest_with_ecdsap256
7	2012-01-16 09:55:21.349150	4a:a1:d4:27:86:32	65	170	21472	certificate_digest_with_ecdsap256
8	2012-01-16 09:55:21.449411	4a:a1:d4:27:86:32	66	170	21572	certificate_digest_with_ecdsap256
9	2012-01-16 09:55:21.549861	4a:a1:d4:27:86:32	67	241	21672	certificate
10	2012-01-16 09:55:21.648998	4a:a1:d4:27:86:32	68	170	21772	certificate_digest_with_ecdsap256
11	2012-01-16 09:55:21.748622	4a:a1:d4:27:86:32	69	170	21872	certificate_digest_with_ecdsap256
12	2012-01-16 09:55:21.848923	4a:a1:d4:27:86:32	70	170	21972	certificate_digest_with_ecdsap256
13	2012-01-16 09:55:21.948499	4a:a1:d4:27:86:32	71	170	22072	certificate_digest_with_ecdsap256
14	2012-01-16 09:55:22.049673	4a:a1:d4:27:86:32	72	366	22172	certificate

No.	Time	Source	MsgCount	Length	DSecond	Signer Identifier Type
25	2012-01-16 16:17:18.945749	ee:b1:c8:60:45:41	89	170	65535	certificate_digest_with_ecdsap256
26	2012-01-16 16:17:19.002596	ee:b1:c8:60:45:41	90	170	65535	certificate_digest_with_ecdsap256
27	2012-01-16 16:17:19.045924	ee:b1:c8:60:45:41	91	170	65535	certificate_digest_with_ecdsap256
28	2012-01-16 16:17:19.095427	ee:b1:c8:60:45:41	92	170	65535	certificate_digest_with_ecdsap256
29	2012-01-16 16:17:19.146283	ee:b1:c8:60:45:41	93	170	65535	certificate_digest_with_ecdsap256
30	2012-01-16 16:17:19.201618	ee:b1:c8:60:45:41	94	170	65535	certificate_digest_with_ecdsap256
31	2012-01-16 16:17:19.245726	ee:b1:c8:60:45:41	95	170	65535	certificate_digest_with_ecdsap256
32	2012-01-16 16:17:19.295949	ee:b1:c8:60:45:41	96	241	65535	certificate
33	2012-01-16 16:17:19.346115	ee:b1:c8:60:45:41	97	170	65535	certificate_digest_with_ecdsap256
34	2012-01-16 16:17:19.395684	ee:b1:c8:60:45:41	98	170	65535	certificate_digest_with_ecdsap256
35	2012-01-16 16:17:19.445933	ee:b1:c8:60:45:41	99	170	65535	certificate_digest_with_ecdsap256
36	2012-01-16 16:17:19.496153	ee:b1:c8:60:45:41	100	170	65535	certificate_digest_with_ecdsap256
37	2012-01-16 16:17:19.545927	ee:b1:c8:60:45:41	101	170	65535	certificate_digest_with_ecdsap256
38	2012-01-16 16:17:19.595639	ee:b1:c8:60:45:41	102	170	65535	certificate_digest_with_ecdsap256
39	2012-01-16 16:17:19.645692	ee:b1:c8:60:45:41	103	194	65535	certificate_digest_with_ecdsap256
40	2012-01-16 16:17:19.695412	ee:b1:c8:60:45:41	104	170	65535	certificate_digest_with_ecdsap256
41	2012-01-16 16:17:19.745731	ee:b1:c8:60:45:41	105	170	65535	certificate_digest_with_ecdsap256
42	2012-01-16 16:17:19.798285	ee:b1:c8:60:45:41	106	241	65535	certificate
43	2012-01-16 16:17:19.845911	ee:b1:c8:60:45:41	107	170	65535	certificate_digest_with_ecdsap256
44	2012-01-16 16:17:19.895839	ee:b1:c8:60:45:41	108	170	65535	certificate_digest_with_ecdsap256
45	2012-01-16 16:17:19.945876	ee:b1:c8:60:45:41	109	170	65535	certificate_digest_with_ecdsap256
46	2012-01-16 16:17:19.995765	ee:b1:c8:60:45:41	110	170	65535	certificate_digest_with_ecdsap256
47	2012-01-16 16:17:20.045936	ee:b1:c8:60:45:41	111	170	65535	certificate_digest_with_ecdsap256

**Figure 23 - Over-the-Air Packets Capture**  
showing Transmission Rates 2 (min), 10 (default) & 20 (max) Hz

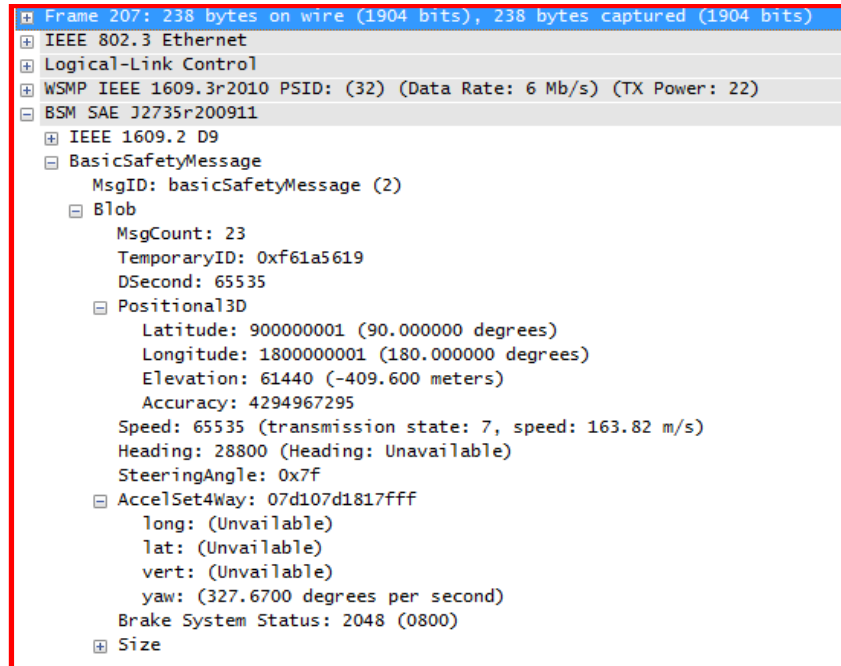


Figure 24 "Unavailable Values when removing GPS Signal

No.	Time	Source	MsgCount	Length	DSecond	RadiusOfCurve	Confidence01	crumbData
3	2012-02-07 10:21:45.807128	00:26:ad:01:20:d2	1	402	8600,8600	0	0	0 pathHistoryPointSets-04
4	2012-02-07 10:21:45.907192	00:26:ad:01:20:d2	2	402	8700,8700	0	0	0 pathHistoryPointSets-04
5	2012-02-07 10:21:46.037326	00:26:ad:01:20:d2	3	402	8800,8800	0	0	0 pathHistoryPointSets-04
6	2012-02-07 10:21:46.107270	00:26:ad:01:20:d2	4	402	8900,8900	0	0	0 pathHistoryPointSets-04
7	2012-02-07 10:21:46.207479	00:26:ad:01:20:d2	5	527	9000,9000	0	0	0 pathHistoryPointSets-04
8	2012-02-07 10:21:46.307366	00:26:ad:01:20:d2	6	404	9100,9100	530	180	180 pathHistoryPointSets-04
9	2012-02-07 10:21:46.407409	00:26:ad:01:20:d2	7	402	9200,9200	-3	0	0 pathHistoryPointSets-04
10	2012-02-07 10:21:46.507454	00:26:ad:01:20:d2	8	403	9300,9300	-932	0	0 pathHistoryPointSets-04
11	2012-02-07 10:21:46.607497	00:26:ad:01:20:d2	9	403	9400,9400	1248	80	80 pathHistoryPointSets-04
12	2012-02-07 10:21:46.707698	00:26:ad:01:20:d2	10	529	9500,9500	785	160	160 pathHistoryPointSets-04
13	2012-02-07 10:21:46.907615	00:26:ad:01:20:d2	11	402	9600,9600	4	0	0 pathHistoryPointSets-04
14	2012-02-07 10:21:46.908228	00:26:ad:01:20:d2	12	403	9700,9700	827	0	0 pathHistoryPointSets-04

Frame 3: 402 bytes on wire (3216 bits), 402 bytes captured (3216 bits)

- Prism capture header
- IEEE 802.11 QoS Data, Flags: .....
- Logical-Link Control
- WSMP IEEE 1609.3r2010 PSID: (32) (Channel: 172) (Data Rate: 6 Mb/s) (TX Power: 30)
- BSM SAE J2735r200911
  - IEEE 1609.2 D9
    - BasicSafetyMessage
      - MsgID: basicSafetyMessage (2)
        - Blob
          - VehicleSafetyExtension
            - PathHistory
              - ItemCnt: 0
              - crumbData: pathHistoryPointSets-04 (3)
            - PathPrediction
              - RadiusOfCurve: 0 (0.00)
              - Confidence01: 0

Figure 25 Over-the-Air Packet Capture showing BSM Part II Interval (N=1) per Part I Transmission

Congestion Control Testing (B-9) under section 5.3.9 covering OBE-DRS044 through 051 will be addressed when implemented.

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**STATIONARY VEHICLE TESTING:**


TEST REQUIREMENTS			
TC ID: SV-1 Range Performance		Category: Stationary Vehicle Test	
STEP	TEST DESCRIPTION		
Record	Vehicle Type Used: [Year Manufacturer Model (VIN)]		
Setup	Outdoor test environment needs to be free of any reflective objects. (OBE-TST002 Measurement Locations, OBE-TST003 Stationary Vehicle & OBE-TST007 No Obstructions within 1 Km)		
Setup	Reference Device Test Tool <b>w/GPS Synchronization</b> shall use OBE omni-directional antenna (3 dBi gain) & RSU omni-directional antenna (9 dBi gain). Set BSM to CH172 channel, 6 Mbps data rate & 10 Hz transmissions. If running parallel tests, channel can be set to CH178 or Ch184 for test efficiency.		
Setup	Position stationary vehicle type (UUT) facing forward.		
Setup	Record UUT's BSM packets capture through Reference Device Test Tool located at designated distance, Packet Sniffer Test Tool <b>w/GPS Synchronization</b> located inside the vehicle to verify initial transmission and file naming (MAC address association with orientation) and internally using suitable software decoders analyze the packets to verify the following: <div>(OBE-TST001 Transmission Measurements)</div>		
		Pass / Fail	Certification [Yes/No]
Run 1	Take UUT's Over-the Air captures (~100 seconds) with Reference Device Test Tool using RSU antenna at 300m distance. All UUT Devices tested. <b>Record Packets Loss (%): N/A</b> (OBE-DRS042 Transmit Range)	NT	No
Run 2	Take UUT's Over-the Air captures (~100 seconds) with Reference Device Test Tool using OBE antenna at 300m distance. All UUT Devices tested. <b>Record Packets Loss (%): ## / ##</b> (OBE-DRS042 Transmit Range)		Yes
Run 3	Take UUT's Over-the Air captures with Reference Device Test Tool using RSU antenna mounted on vehicle driving from 0m to beyond 600m distance & its return. All UUT Devices tested. <b>Record Packets Losses per second minimum &amp; data capture very second and plotted every ~2 seconds.</b> (OBE-DRS042 Transmit Range)	NT	No
Run 4	Take UUT's Over-the Air captures with Reference Device Test Tool using OBE antenna without GPS antenna. Did device return "Unavailable" values? (OBE-POS004 Positioning Failure Handling (Null Value))		Yes
Run 5	Take UUT's Over-the Air captures with Reference Device Test Tool using OBE antenna inside the vehicle driving from 0m to beyond 550/850m distance & its return. (loss of reception). All UUT devices tested. <b>Record Packets Losses per second minimum &amp; data capture very second and plotted every ~2 seconds.</b> (OBE-DRS042 Transmit Range)	NT	No



## Moving Vehicle Testing

Run 6a	Take UUT's Over-the Air captures with Reference Device Test Tool using OBE antenna mounted on vehicle driving from 0m to beyond 350m distance & its return. <b>Record Packets Losses per second minimum &amp; data capture very second and plotted every ~2 seconds.</b> Plots are shown at 100m & 300m distances. Repeat in rotating the vehicle <b>Type</b> with UUT #1 at: <b>Outbound / Inbound</b> (OBE-DRS042 Transmit Range Rotation)	<b>See Table ##</b>	Yes
Run 6b	Repeat in rotating the vehicle <b>Type</b> with UUT <b># 1</b> at: <b>Outbound/Inbound.</b> (OBE-DRS042 Transmit Range Rotation)	<b>See Table ##</b>	Yes
Run 6c	Repeat in rotating the vehicle <b>Type</b> with UUT <b># 2</b> at: <b>Outbound/Inbound.</b> (OBE-DRS042 Transmit Range Rotation)	<b>See Table ##</b>	Yes
<b>Observations:</b>			
<b>DATE:</b> Month 2012		<b>TESTER:</b> OmniAir	<b>UUT Model &amp; Serial No.:</b>



UUT#1	UUT#2
	
<p><b>Table 2 – Moving Sedan / SUV Vehicle Testing with OBE Interior Hirschmann Sharkfin / Mobile Mark Window Mount Antenna from 0 – 350m Range</b></p>	

UUT#1	UUT#2
	
<p><b>Table 3 – Moving Sedan / SUV Vehicle Testing with OBE Interior Hirschmann Sharkfin / Mobile Mark Window Mount Antenna from 0 – 350m Range</b></p>	



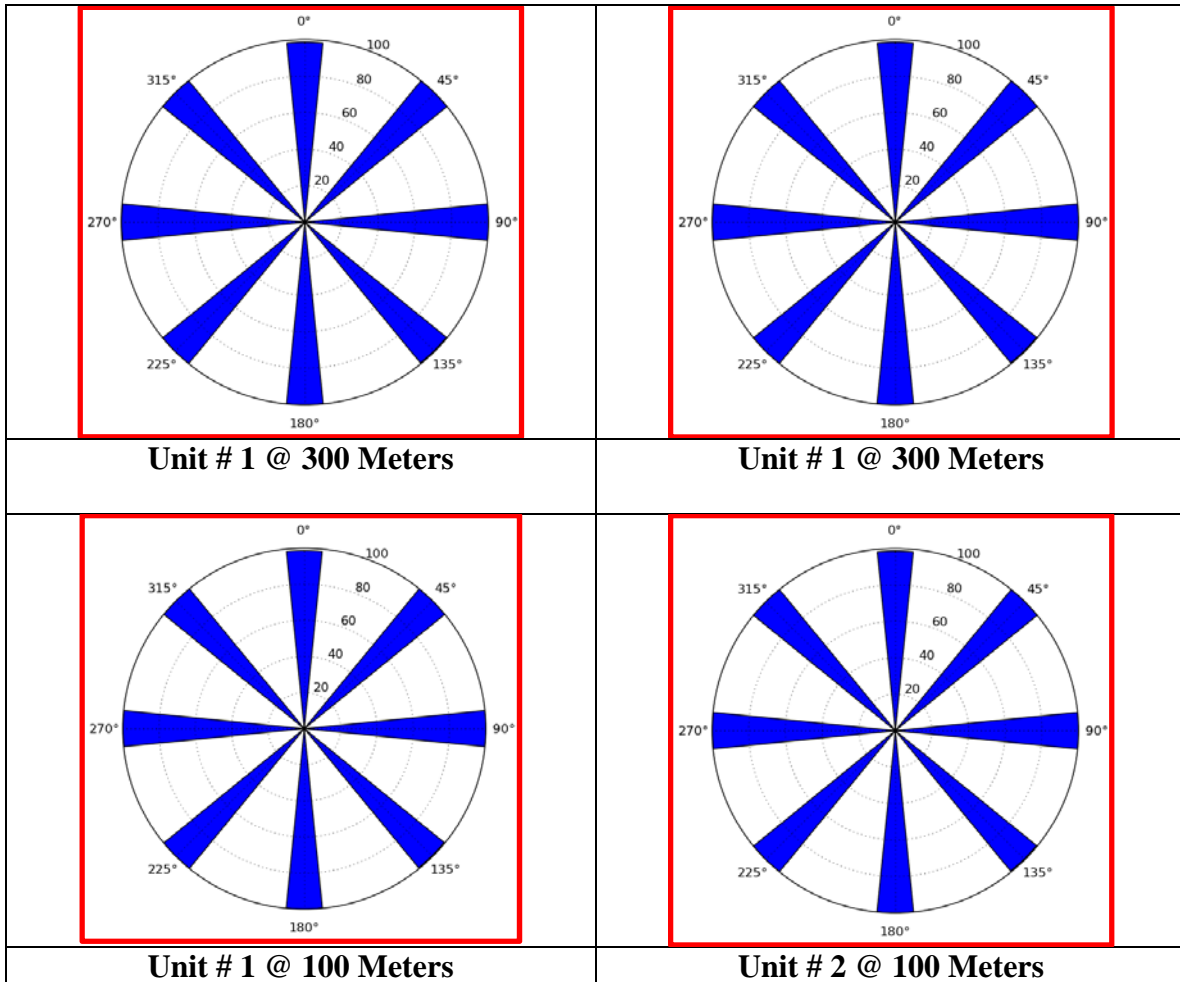


Figure 26 - Packets Capture Rate Every Two Seconds using UUT#1 & 2 with Sedan Vehicle from 0 to 350m at different Rotation Angles  
(Dotted lines indicate percent packet reception rate at specific distance)

Sedan Device #	Outbound @ 300m					Inbound @ 300m				
Test Run	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)
000°-Interior										
045° - Interior										
090° - Interior										
135° - Interior										
180° -Interior										
225° - Interior										
270° - Interior										
315° - Interior										
000° - Static										
000° - No GPS										
<b>Total</b>										

Table 4 – Sedan Vehicle Rotation with UUT#1 & OBE Interior Antenna @ 300m

Sedan Device #	Outbound @ 300m					Inbound @ 300m				
Test Run	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)
000°-Interior										
045° - Interior										
090° - Interior										
135° - Interior										
180° -Interior										
225° - Interior										
270° - Interior										
315° - Interior										
000° - Static										
000° - No GPS										
Total										

Table 5 – Sedan Vehicle Rotation with UUT#2 &amp; OBE Interior Antenna @ 300m

Sedan Device #	Outbound @ 100m					Inbound @ 100m				
Test Run	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)
000°-Interior										
045° - Interior										
090° - Interior										
135° - Interior										
180° -Interior										
225° - Interior										
270° - Interior										
315° - Interior										
000° - Static										
000° - No GPS										
Total										

Table 6 – Sedan Vehicle Rotation with UUT#1 &amp; OBE Interior Antenna @ 100m

Sedan Device #	Outbound @ 100m					Inbound @ 100m				
Test Run	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)
000°-Interior										
045° - Interior										
090° - Interior										
135° - Interior										
180° -Interior										
225° - Interior										
270° - Interior										
315° - Interior										
000° - Static										
000° - No GPS										
Total										

Table 7 – Sedan Vehicle Rotation with UUT#2 &amp; OBE Interior @ 100m

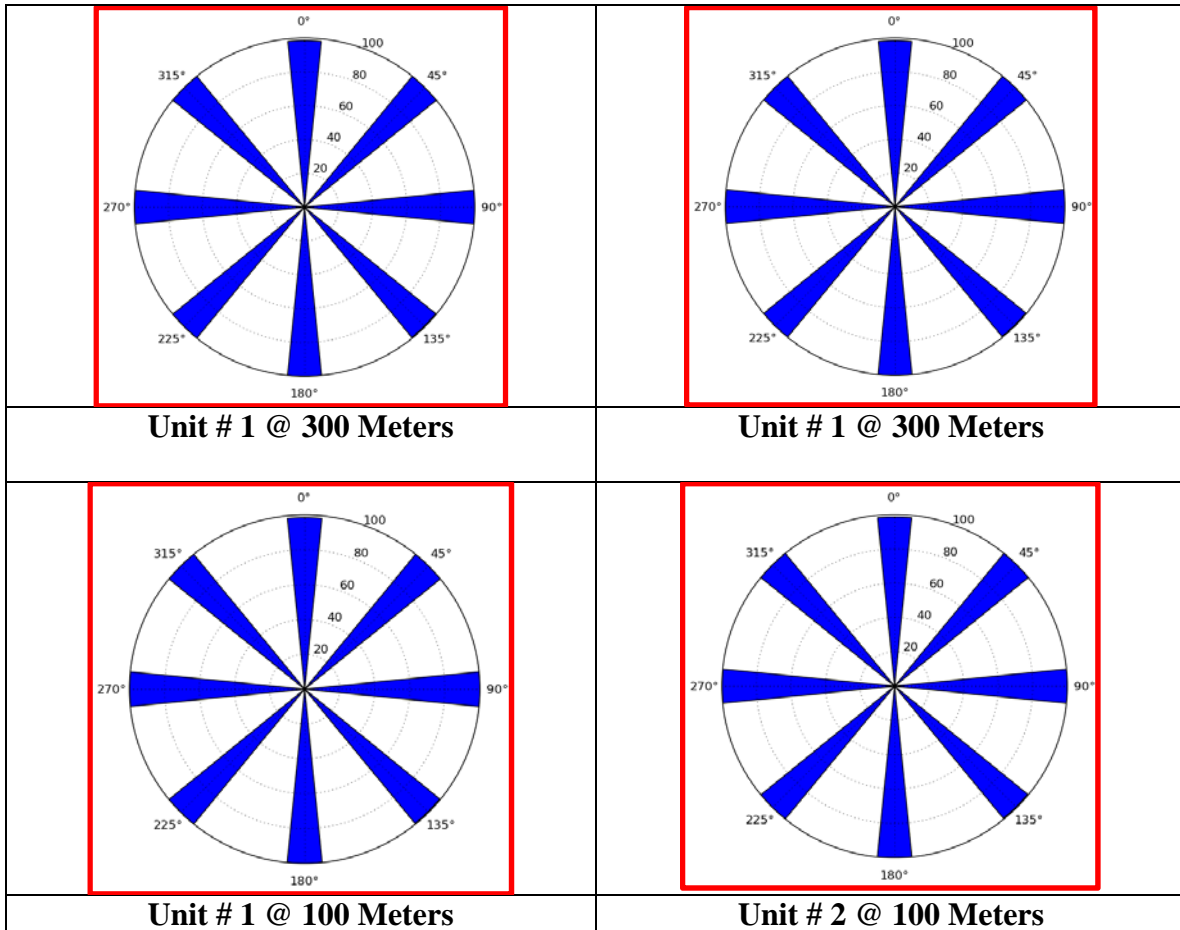


Figure 27 - Packets Capture Rate Every Two Seconds using UUT#1 & 2 with SUV Vehicle from 0 to 350m at different Rotation Angles  
(Dotted lines indicate percent packet reception rate at specific distance)

SUV Device #	Outbound @ 300m					Inbound @ 300m				
Test Run	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)
000°-Interior										
045° - Interior										
090° - Interior										
135° - Interior										
180° -Interior										
225° - Interior										
270° - Interior										
315° - Interior										
000° - Static										
000°- No GPS										
Total										

Table 8 – SUV Vehicle Rotation with UUT#1 & OBE Interior Antenna @ 300m

SUV Device #	Outbound @ 300m					Inbound @ 300m				
Test Run	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)
000°-Interior										
045° - Interior										
090° - Interior										
135° - Interior										
180° -Interior										
225° - Interior										
270° - Interior										
315° - Interior										
000° - Static										
000° - No GPS										
<b>Total</b>										

Table 9 – **SUV** Vehicle Rotation with UUT#2 & OBE Interior Antenna @ 300m

SUV Device #	Outbound @ 100m					Inbound @ 100m				
Test Run	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)
000°-Interior										
045° - Interior										
090° - Interior										
135° - Interior										
180° -Interior										
225° - Interior										
270° - Interior										
315° - Interior										
000° - Static										
000° - No GPS										
<b>Total</b>										

Table 10 – **SUV** Vehicle Rotation with UUT#1 & OBE Interior Antenna @ 100m

Sedan Device #	Outbound @ 100m					Inbound @ 100m				
Test Run	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)	Readings	Expected Msgs	Received Msgs	Packets Lost	Packets Lost (%)
000°-Interior										
045° - Interior										
090° - Interior										
135° - Interior										
180° -Interior										
225° - Interior										
270° - Interior										
315° - Interior										
000° - Static										
000° - No GPS										
<b>Total</b>										

Table 11 – **Sedan** Vehicle Rotation with UUT#2 & OBE Interior @ 100m

## MOVING VEHICLE TESTING:

TEST REQUIREMENTS			
TC ID: MV-1 DSecond and BSM Part II		Category: Moving Vehicle Test	
STEP	TEST DESCRIPTION		
Setup	Test track is 1.9 miles grand prix or 1.0 oval with minimum overhead obstructions. (OBE-TST007 Location)		
Setup	Reference Device Test Tool shall use OBE omni-directional antenna (depends on vehicle and its location). (OBE-TST005 Data Elements) Location and Time Measurement Accuracies of the Reference Tools are ±10 cm and ±1 msec. (OBE-TST006 Ground Truth & OBE-TST008 Time Measurements)		
Setup	In one vehicle, install the UUT and secure it sufficiently to handle a hard braking event (~0.75g). The passenger will hold the PSTT w/GPS synchronization to secure it during the braking events and record data. Use the Over-The-Air data captured, the PSTT, and the PCAP Data Recorder Playback Tool to analyze the BSM Part I DSecond value and the following “Vehicle Safety Extension” component of BSM Part II requirements. UUT parameters should be default parameter if not specified.		
Run	Drive test vehicle (UUT) once around test track (clockwise or counter clockwise if oval track) with Packet Sniffer Test Tool recording. Accelerate on the initial straight-away to around 60 mph and slow down (~10 mph) into the curves. As the vehicle rounds the curve, keep the driver-side tires as close to possible to the marked curve lines. Coming out of the curve, accelerate to about 60 mph. As the vehicle enters into the straight-away, stop the vehicle immediately (complete stop – hard braking).		
		Pass / Fail	Certification [Yes/No]
Run 1	Drive test vehicle around the test track with all UUTs with each UUT transmitting at 10Hz and Security enable. Save Data File		Yes
Run 2	Drive test vehicle (UUT) with one UUT transmitting at 10 Hz and Security Enabled. Record the approximate UTC time and packet # of the event. Save Data file. Hard Braking (UUT#1) CW/CCW started at ## & ended ## (## sec duration) Hard Braking (UUT#2) CW/CCW started at ## & ended ## (## sec duration) (OBE-BSM006 Event Triggered BSM & OBE-TST004 Moving Vehicle)		Yes
Run 3	Drive test vehicle (UUT) with UUT transmitting at 20 Hz and Security Enabled. Record the approximate UTC time and packet # of the event. Save Data file. Hard Braking (UUT#1) CW/CCW started at ## & ended ## (## sec duration) Hard Braking (UUT#2) CW/CCW started at ## & ended ## (## sec duration) (OBE-BSM006 Event Triggered BSM & OBE-TST004 Moving Vehicle)	NT	No
Run 4	Drive vehicle with large “S” Turns for ~ 0.5 miles decreasing speed slowing from 20 to 0 mph, Do not stop but ensure that the speed remains below 0.56 m/s. Do a very slow “U” turn (180°) and increase speed to 10 mph. Did UUT#1&2 Heading Latched when speed drops below 0.56 m/s? (OBE-BSM030 Heading Latching)		Yes

Run 5	Drive vehicle with large “S” Turns for ~ 0.5 miles increasing speed slowing from 0 (stop) to 20mph. Did UUT#1 &2 “Heading” unlatches when speed exceeds 0.83 m/s? (OBE-BSM031 Heading Unlatching)		Yes
		Pass / Fail	Certification [Yes/No]
5	Did vehicle generated EVENT within 50 msec? (OBE-BSM006 Event Triggered BSM)		Yes
6	Did UUT device establish vehicle position every 100 ms? (OBE-POS001 Positioning Occurrence & OBE-TST003 Data Elements)		Yes
7a	Did UUT device implement “DSecond” value (changes) of BSM Part I from sensor source? (OBE-BSM016 DSecond DE Value)		Yes
7b	Compare “DSecond” value of UUT device with other devices and insure “DSecond” value within 1 mseconds. (OBE-BSM0## DSecond Value)		Yes
8	Did UUT device populate the “PathHistory PointSets-04”data? (OBE-BSM037 PathHistory PointSets)		Yes
9	Did UUT device populate the “PathHistory Distance” data representing: • Minimum Distance ( >300m): ### / ### • Perpendicular Distance Difference (<1m): ### / ### (OBE-BSM038 PathHistory Distance and BSM039 Difference)		Yes
10	Did UUT device populate the “PathHistory Data Source” data? (OBE-BSM040 Data Source)		Yes
11	Did UUT device populate the “Conciseness” data correctly? (OBE-BSM041 Conciseness)		Yes
12	Did UUT device populate the “PathHistory Point Order” within the most recent UTC Time? (OBE-BSM042 PathHistory Point Order)		Yes
13	Did UUT device include the “PathHistory Point Maximum Count” with <23 most recent computed set of points? (OBE-BSM043 PathHistory Point Maximum Count)		Yes
14	Did UUT device include the “Path Predication DF Values” for: • Radius data when yaw rate <0.5°/s <sup>2</sup> • No PathPrediction Element if Confidence = 0 • Error Tolerance if RadiusOfCurve <one half lane width? (OBE-BSM044 PP DF Values, BSM045 PP Confidence & BSM046 PP Error Tolerance)		Yes
15	Did the Static Certificate not change when EVENT occurs? (OBE-DRS021 Static Certificate while in Event Condition)	NT	No
16	Did UUT device include EventFlags data (including Hard Braking) from BSM Part II during the event with <220 ms latency? (OBE-BSM034 EventFlag DE Persistence & BSM035 Hard Braking Flag & BSM036 Latency)		Yes
Observations: • [#]			
DATE: Month 2012		TESTER: OmniAir	
UUT Model & Serial No.:			

No.	Time	MsgCount	Length	DSecond	Speed	AccelSet4Way	Heading	ItemCnt	Events	RadiusOfCurve	Confidence01

**Figure 28 - Over-The-Air Packet Capture of Hard Braking Event at Packet ## ( m/s) start and Packet ## ( m/s) complete showing Packet ## ( m/s) with BSM Part I & II Transmitting 10 Hz**

[illegible]

Figure 29 Hard Braking Event starting at Packet ### and ends Packet ###  
Transmitting 20 Hz (not tested)



No.	Time	Source	MsgCount	Length	DSecond	Speed	Heading	Signer Identifier	Type
298	2012-01-19 13:45:02.604286	03:f6:3e:fa:be:d4	90	167	2600	57379	17112	certificate_digest_with_ecdsap25	
299	2012-01-19 13:45:02.704217	03:f6:3e:fa:be:d4	91	167	2700	57379	17088	certificate_digest_with_ecdsap25	
300	2012-01-19 13:45:02.804220	03:f6:3e:fa:be:d4	92	167	2799	57377	17064	certificate_digest_with_ecdsap25	
301	2012-01-19 13:45:02.904141	03:f6:3e:fa:be:d4	93	167	2899	57379	17048	certificate_digest_with_ecdsap25	
302	2012-01-19 13:45:03.004704	03:f6:3e:fa:be:d4	94	238	3000	57377	17112	certificate	
303	2012-01-19 13:45:03.107674	03:f6:3e:fa:be:d4	95	167	3100	57377	17112	certificate_digest_with_ecdsap25	
304	2012-01-19 13:45:03.204168	03:f6:3e:fa:be:d4	96	167	3200	57375	17104	certificate_digest_with_ecdsap25	
305	2012-01-19 13:45:03.304162	03:f6:3e:fa:be:d4	97	167	3299	57375	17104	certificate_digest_with_ecdsap25	
306	2012-01-19 13:45:03.404788	03:f6:3e:fa:be:d4	98	225	3399	57373	17160	certificate_digest_with_ecdsap25	
307	2012-01-19 13:45:03.504176	03:f6:3e:fa:be:d4	99	167	3500	57373	17160	certificate_digest_with_ecdsap25	
308	2012-01-19 13:45:03.604648	03:f6:3e:fa:be:d4	100	238	3600	57370	17160	certificate	
309	2012-01-19 13:45:03.704134	03:f6:3e:fa:be:d4	101	167	3700	57370	17160	certificate_digest_with_ecdsap25	
310	2012-01-19 13:45:03.804147	03:f6:3e:fa:be:d4	102	167	3799	57369	17160	certificate_digest_with_ecdsap25	
311	2012-01-19 13:45:03.904114	03:f6:3e:fa:be:d4	103	167	3899	57369	17160	certificate_digest_with_ecdsap25	

<p>305 2012-01-19 13:45:03.404162 03:f6:3e:fa:be:d4 ff:ff:ff:ff:ff:ff BSM SAE J2735r200911</p> <p>Frame 305: 167 bytes on wire (1336 bits), 167 bytes captured (1336 bits) on interface 0</p> <p>IEEE 802.3 Ethernet</p> <p>Logical-Link Control</p> <p>WSMP IEEE 1609.3r2010 PSID: (32) (Data Rate: 6 Mb/s) (TX Power: 20)</p> <p>BSM SAE J2735r200911</p> <p>IEEE 1609.2 D9</p> <p>BasicSafetyMessage</p> <p>MsgID: basicSafetyMessage (2)</p> <p>Blob</p> <p>MsgCount: 97</p> <p>TemporaryID: 0xc32e0957</p> <p>DSecond: 3299</p> <p>Positional3D</p> <p>Speed: 57375 (transmission state: 7, speed: 0.62 m/s)</p> <p>Heading: 17104 (213.8000 degrees)</p> <p>SteeringAngle: 0x7f</p> <p>AccelSet4Way: 00000000810000</p> <p>Brake System Status: 2048 (0800)</p> <p>Size</p>	<p>306 2012-01-19 13:45:03.404788 03:f6:3e:fa:be:d4 ff:ff:ff:ff:ff:ff BSM SAE J2735r200911</p> <p>Frame 306: 225 bytes on wire (1800 bits), 225 bytes captured (1800 bits) on interface 0</p> <p>IEEE 802.3 Ethernet</p> <p>Logical-Link Control</p> <p>WSMP IEEE 1609.3r2010 PSID: (32) (Data Rate: 6 Mb/s) (TX Power: 20)</p> <p>BSM SAE J2735r200911</p> <p>IEEE 1609.2 D9</p> <p>BasicSafetyMessage</p> <p>MsgID: basicSafetyMessage (2)</p> <p>Blob</p> <p>MsgCount: 98</p> <p>TemporaryID: 0xc32e0957</p> <p>DSecond: 3399</p> <p>Positional3D</p> <p>Speed: 57373 (transmission state: 7, speed: 0.58 m/s)</p> <p>Heading: 17160 (214.5000 degrees)</p> <p>SteeringAngle: 0x7f</p> <p>AccelSet4Way: ffe400078102bc</p> <p>Brake System Status: 2048 (0800)</p> <p>Size</p> <p>VehicleSafetyExtension</p> <p>PathHistory</p> <p>PathPrediction</p>
---	--

Figure 30 Heading Latching (0.56 m/s target) occurred between 0.## m/s and 0.## m/s

No.	Time	Source	MsgCount	Length	DSecond	Speed	Heading	Signer Identifier	Type
1772	2012-01-19 13:47:30.002150	03:f6:3e:fa:be:d4	28	167	30000	57384	17160	certificate_digest_with_ecdsap25	
1773	2012-01-19 13:47:30.102677	03:f6:3e:fa:be:d4	29	238	30100	57384	17160	certificate	
1774	2012-01-19 13:47:30.202328	03:f6:3e:fa:be:d4	30	167	30199	57384	17160	certificate_digest_with_ecdsap25	
1775	2012-01-19 13:47:30.302105	03:f6:3e:fa:be:d4	31	167	30300	57384	17160	certificate_digest_with_ecdsap25	
1776	2012-01-19 13:47:30.402999	03:f6:3e:fa:be:d4	32	248	30399	57384	17160	certificate_digest_with_ecdsap25	
1777	2012-01-19 13:47:30.502312	03:f6:3e:fa:be:d4	33	167	30500	57383	17160	certificate_digest_with_ecdsap25	
1778	2012-01-19 13:47:30.602090	03:f6:3e:fa:be:d4	34	167	30600	57384	17160	certificate_digest_with_ecdsap25	
1779	2012-01-19 13:47:30.702578	03:f6:3e:fa:be:d4	35	238	30800	57386	2968	certificate	
1780	2012-01-19 13:47:30.801563	03:f6:3e:fa:be:d4	36	167	30800	57386	2968	certificate_digest_with_ecdsap25	
1781	2012-01-19 13:47:30.902157	03:f6:3e:fa:be:d4	37	167	30899	57384	3080	certificate_digest_with_ecdsap25	
1782	2012-01-19 13:47:31.002113	03:f6:3e:fa:be:d4	38	167	31000	57387	2896	certificate_digest_with_ecdsap25	
1783	2012-01-19 13:47:31.102085	03:f6:3e:fa:be:d4	39	167	31100	57387	2904	certificate_digest_with_ecdsap25	
1784	2012-01-19 13:47:31.202859	03:f6:3e:fa:be:d4	40	238	31199	57386	2952	certificate	

<p>1778 2012-01-19 13:47:30.602090 03:f6:3e:fa:be:d4 ff:ff:ff:ff:ff:ff BSM SAE J2735r200911 167</p> <p>Frame 1778: 167 bytes on wire (1336 bits), 167 bytes captured (1336 bits) on interface 0</p> <p>IEEE 802.3 Ethernet</p> <p>Logical-Link Control</p> <p>WSMP IEEE 1609.3r2010 PSID: (32) (Data Rate: 6 Mb/s) (TX Power: 20)</p> <p>BSM SAE J2735r200911</p> <p>IEEE 1609.2 D9</p> <p>BasicSafetyMessage</p> <p>MsgID: basicSafetyMessage (2)</p> <p>Blob</p> <p>MsgCount: 34</p> <p>TemporaryID: 0xc32e0957</p> <p>DSecond: 30600</p> <p>Positional3D</p> <p>Speed: 57384 (transmission state: 7, speed: 0.80 m/s)</p> <p>Heading: 17160 (214.5000 degrees)</p> <p>SteeringAngle: 0x7f</p> <p>AccelSet4Way: 001cfffef81fb50</p> <p>Brake System Status: 2048 (0800)</p> <p>Size</p>	<p>1779 2012-01-19 13:47:30.702578 03:f6:3e:fa:be:d4 ff:ff:ff:ff:ff:ff BSM SAE J2735r200911 238</p> <p>Frame 1779: 238 bytes on wire (1904 bits), 238 bytes captured (1904 bits) on interface 0</p> <p>IEEE 802.3 Ethernet</p> <p>Logical-Link Control</p> <p>WSMP IEEE 1609.3r2010 PSID: (32) (Data Rate: 6 Mb/s) (TX Power: 20)</p> <p>BSM SAE J2735r200911</p> <p>IEEE 1609.2 D9</p> <p>BasicSafetyMessage</p> <p>MsgID: basicSafetyMessage (2)</p> <p>Blob</p> <p>MsgCount: 35</p> <p>TemporaryID: 0xc32e0957</p> <p>DSecond: 30800</p> <p>Positional3D</p> <p>Speed: 57386 (transmission state: 7, speed: 0.84 m/s)</p> <p>Heading: 2968 (37.1000 degrees)</p> <p>SteeringAngle: 0x7f</p> <p>AccelSet4Way: 000efffe81ff6a</p> <p>Brake System Status: 2048 (0800)</p> <p>Size</p>
---	--

Figure 31 Heading Unlatching (0.83 m/s target) occurred between 0.## and 0.## m/s



No.	Time	MsgCount	Length	DSecond	Speed	crumbData	ItemCi	Events	Accuracy	RadiusOfCurve	Confidence01
170	2012-01-19 15:21:23.861274	52	327	24025	58439	pathHistoryPointSets-04	14		4294967295	-3802	
180	2012-01-19 15:21:24.861404	62	327	25025	58499	pathHistoryPointSets-04	14		4294967295	-3356	
190	2012-01-19 15:21:25.861653	72	327	26025	58539	pathHistoryPointSets-04	14		4294967295	-3381	
200	2012-01-19 15:21:26.860939	82	327	27025	58579	pathHistoryPointSets-04	14		4294967295	-4019	
210	2012-01-19 15:21:27.861615	92	326	28025	58605	pathHistoryPointSets-04	14		4294967295	32767	
325	2012-01-19 15:21:38.860688	74	327	39025	58528	pathHistoryPointSets-04	14		4294967295	999	
336	2012-01-19 15:21:39.861536	84	327	40025	58537	pathHistoryPointSets-04	14		4294967295	979	
426	2012-01-19 15:21:48.860966	46	327	49025	58657	pathHistoryPointSets-04	14		4294967295	4763	
436	2012-01-19 15:21:49.860524	56	327	50025	58662	pathHistoryPointSets-04	14		4294967295	5512	
346	2012-01-19 15:21:40.861420	94	346	41025	58549	pathHistoryPointSets-04	16		4294967295	996	
356	2012-01-19 15:21:41.861306	104	346	42025	58556	pathHistoryPointSets-04	16		4294967295	1066	
406	2012-01-19 15:21:46.861660	26	346	47025	58639	pathHistoryPointSets-04	16		4294967295	3248	
416	2012-01-19 15:21:47.861324	36	346	48025	58649	pathHistoryPointSets-04	16		4294967295	3908	
366	2012-01-19 15:21:42.861384	114	354	43025	58575	pathHistoryPointSets-04	17		4294967295	1162	
376	2012-01-19 15:21:43.861731	124	354	44025	58594	pathHistoryPointSets-04	17		4294967295	1342	
386	2012-01-19 15:21:44.861774	6	353	45025	58612	pathHistoryPointSets-04	17		4294967295	1833	
396	2012-01-19 15:21:45.861170	16	354	46025	58627	pathHistoryPointSets-04	17		4294967295	2442	

Figure 32 PathHistory Most Points of BSM Part II

File

Path History Report

Index

Value

Clear

First Point Over 300m:

Shortest History After First Peak:

Max Number of History Points:

Max Perpendicular Distance (2D):

Max Perpendicular Distance (3D):

☒ Log All BSMs  
☒ Log Part II Details

OmniAir

Potential Errors

UDPClnt was already bound to port 40030

File

Path History Report

Index

Value

Clear

First Point Over 300m:

Shortest History After First Peak:

Max Number of History Points:

Max Perpendicular Distance (2D):

Max Perpendicular Distance (3D):

☒ Log All BSMs  
☒ Log Part II Details

OmniAir

Potential Errors

UDPClnt was already bound to port 40030

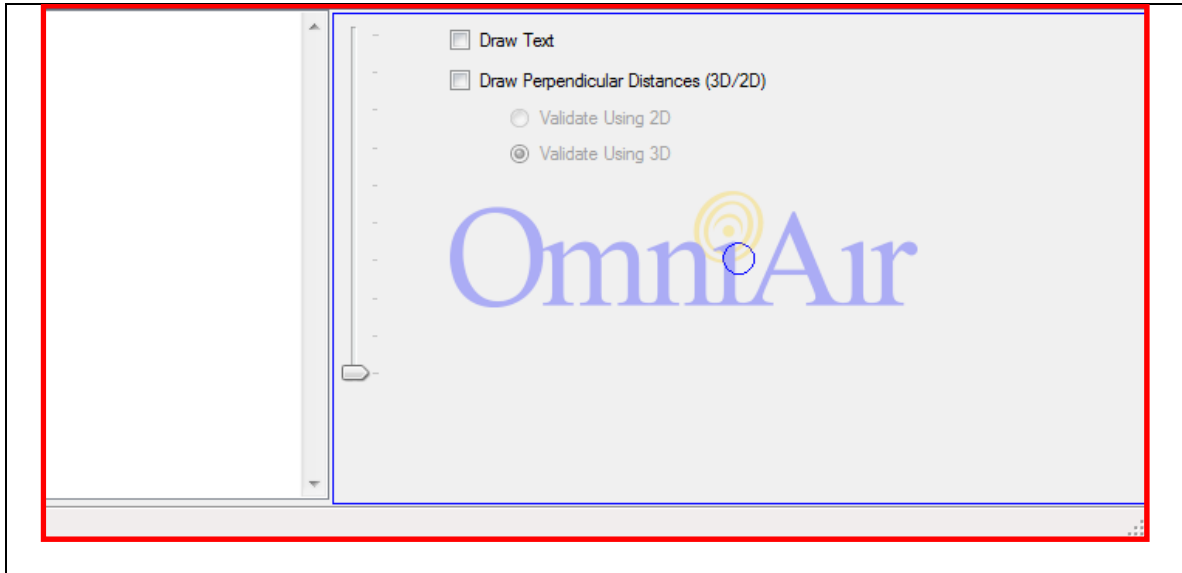
Figure 33 BSM Point II Analyzer Summary

[Insert Image]
[Insert Image]

**[Figure 34 Shortest Distance Represented (>300m) over PathHistory]**

[Insert Image]
[Insert Image]

**Figure 35 Visual PathHistory Representation**



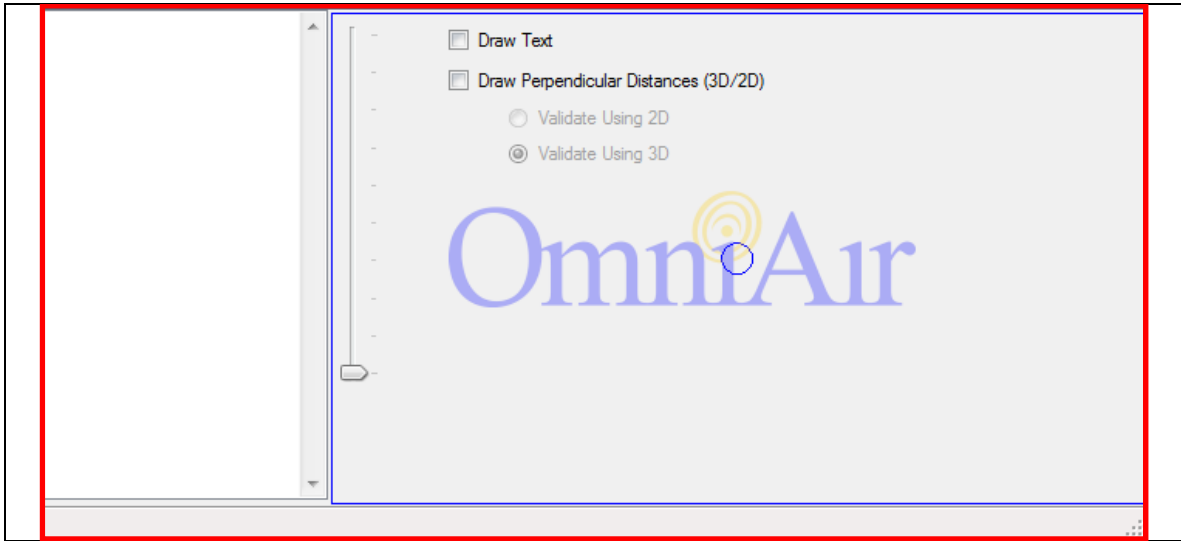


Figure 36 Zoomed to show Perpendicular Distance of 1.###m

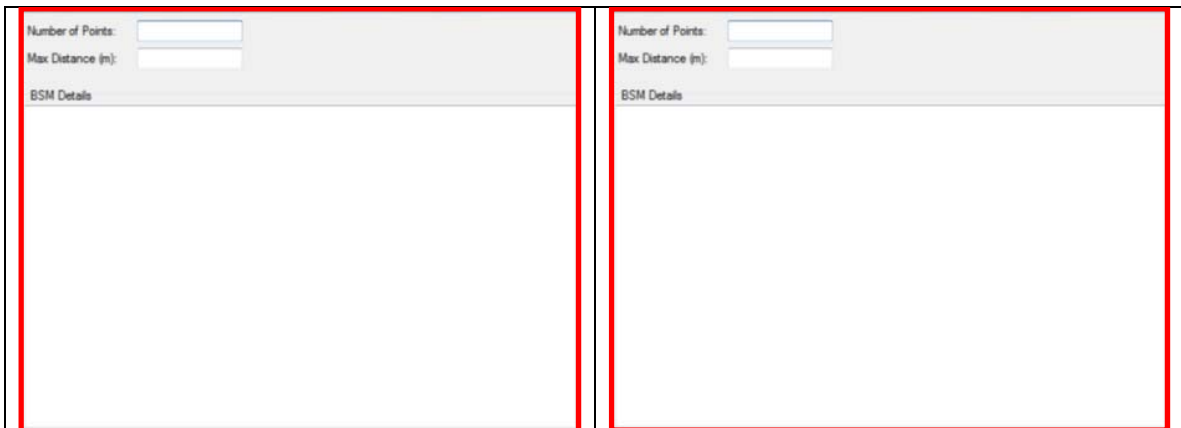


Figure 37 PathHistory showing ## Most Recent Points Populated First

TEST REQUIREMENTS			
TC ID: MV-2 Positioning Services		Category: Moving Vehicle Test	
STEP	TEST DESCRIPTION		
Record	Vehicle Type Used: <b>Year Manufacturer Model</b>		
Setup	Test track is <b>1.9 miles Gran Prix Road Course</b> or <b>1 mile oval</b> with no overhead obstructions (OBE-TST007 Location).		
Setup	Data is being recorded at 10 Hz over 10 minute duration minimum. (OBE-TST005 Data Elements). Location and Time Measurement Accuracies of the GPS Reference Tools are $\pm 10$ cm and 1 msec. (OBE-TST006 Ground Truth & OBE-TST008 Time Measurements)		
Setup	Record Position Accuracy through GPS Reference Test Tool and PCAP BSMs with either Packet Sniffer with GPS Synchronization or DSRC Reference Tool with OBE Antenna located inside the vehicle and internally using suitable software decoders analyze the packets to verify the following:		
Run 1	Drive test vehicle (UUT) 20 MPH around test track once each direction (avoiding any overhead obstacles). Plot # 1 XY, 2 Rotated, 7 Speed, 8 Heading & 9 Elevation data on position services results. (OBE-TST004 Moving Vehicle)		
Run 2	Drive test vehicle (UUT) 45 MPH around test track once each direction (avoiding any overhead obstacles). Plot # 3XY, 4 Rotated, 10 Speed, 11 Heading & 12 Elevation data on position services results. (OBE-TST004 Moving Vehicle)		
Run 3	Drive test vehicle (UUT) 60 MPH around test track once each direction (avoiding any overhead obstacles). Plot# 5 XY, 6 Rotated, 13 Speed, 14 Heading & 15 Elevation data on position services results. (OBE-TST004 Moving Vehicle)		
Run 4	Drive test vehicle (UUT) tight figure-eight on the test track. Not conducted due to road course used. (OBE-TST004 Moving Vehicle)		
		Pass / Fail	Certification [Yes/No]
5	Did the latitude/longitude values populate +/- 1.5m accuracy with HDOP <5 correctly under $\pm 1$ sigma error? (OBE-BSM018 Latitude & BSM021 Longitude)		Yes
6	Did the elevation values populate +/- 3.0m accuracy with HDOP <5 correctly under $\pm 1$ sigma error? (OBE-BSM024 Elevation)		Yes
7	Did UUT populate and derive the current heading ( $< 2^\circ$ ) when moving between 0.56 m/s and 12.5 m/s? (OBE-BSM029 Heading Accuracy)		Yes
8	Did UUT populate and derive the current vehicle speed ( $\pm 0.35$ m/s) and heading ( $\pm 3^\circ$ ) when moving $> 12.5$ m/s? (OBE-POS002 Speed & OBE-BSM027 Heading)		Yes
9	Do UUT device set the Positional Accuracy DF Value of BSM? (OBE-BSM0025 Positional Accuracy DF Value)		Yes
<b>Observations:</b> <ul style="list-style-type: none"> <li>[#]</li> </ul>			
DATE: Month 2012		TESTER: OmniAir	UUT Model & Serial No.:

### Vehicle Tracking versus GPS Reference Test Tool around Race Track:

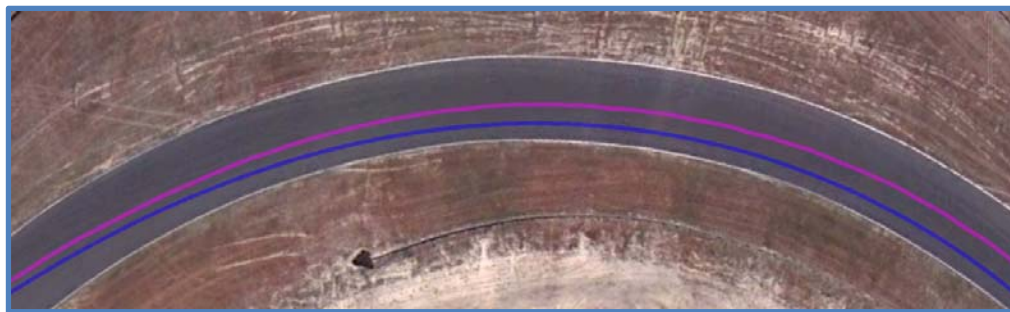


Figure 38 Vehicle Tracking (Purple) versus GPS Reference Test Tool (blue,  $\pm$  ##cm)

**Plots for Vehicle Position (OBE-POS003) travelling around Race Track:**

Two UUTs with Security Enabled and Vehicle Offsets/Vehicle Type incorporated were used during Month 2012 test session.

<p>[Insert]</p> <p>[Insert]</p>	<p>[Insert]</p> <p>[Insert]</p>
<p><b>XY Plot 1 @ 20mph</b></p>	<p><b>Rotated Plot 2 @ 20mph</b></p>

<p>[Insert]</p> <p>[Insert]</p>	<p>[Insert]</p> <p>[Insert]</p>
<p><b>XY Plot 3 @ 45mph</b></p>	<p><b>Rotated Plot 4 @ 45mph</b></p>

<p>[Insert]</p> <p>[Insert]</p>	<p>[Insert]</p> <p>[Insert]</p>
<p><b>XY Plot 5 @ 60mph</b></p>	<p><b>Rotated Plot 6 @ 60mph</b></p>





**Plots for Vehicle Speed, Heading & Elevations Accuracies (OBE-POS002):**

<p>[Insert]</p> <p>[Insert]</p>	<p>[Insert]</p> <p>[Insert]</p>
<p><b>Plot 7 Speed Accuracy @ 20mph</b></p>	<p><b>Plot 8 Heading Accuracy @ 20mph</b></p>

<p>[Insert]</p> <p>[Insert]</p>	<p>[Insert]</p> <p>[Insert]</p>
<p><b>Plot 9 Speed Accuracy @ 45mph</b></p>	<p><b>Plot 10 Heading Accuracy @ 45mph</b></p>

<p>[Insert]</p> <p>[Insert]</p>	<p>[Insert]</p> <p>[Insert]</p>
<p><b>Plot 11 Speed Accuracy @ 60mph</b></p>	<p><b>Plot 12 Heading Accuracy @ 60mph</b></p>

[Insert] [Insert]

**Plot 13 Elevation Accuracy @ 20mph**

[Insert] [Insert]

**Plot 14 Elevation Accuracy @ 45mph**

[Insert] [Insert]

**Plot 15 Elevation Accuracy @ 60mph**

**TEST SETUP PHOTOGRAPHS:**

**[Insert]**

**Photograph 4 - Bench Setup of UUT Device**

**[Insert]**

**Photograph 5 - UUT in Stationary Vehicle during Range Testing**

**[Insert]**

**Photograph 6 UUT's Antenna Placement on Roof during Vehicle Rotation Tests**



**Photograph 7 - Racetrack (Location)**



**Photograph 8 Hard Braking Event**

**DATA FILES [Manufacturer-TestType-TestNumber-Other]:**

<b>Files Names:</b>	<b>Description:</b>
<b>Month 2012</b> GPS Positioning plots	Folder containing plots of all GPS positioning plots taken in Month.
<b>Month 2012</b> Vehicle Testing PCAP data	Folder containing vehicle testing PCAP files for Antenna Rotation, PER Range, Hard Braking & Latching data
<b>Month 2012</b> Bench testing PCAP files	Folder containing bench testing PCAP files



**TEST SOFTWARE REVISION:**

Test Software	Revision	Date
Novatel		
BSM Part I & Payback Analyzer	1.0-3764	
BSM Part II Graphic Analyzer	1.0-3773	
Vehicle Positioning Graphic Analyzer	1.0-5210	
WireShark BSM Analyzer Dissectors (Installer 2/08/2012):	1.6.4	
• Aerolink.dll	3.0.0.3	08/26/2012
• BSM.config		12/13/2011
• BSM.dll	2.2.0.0	09/23/2012
• Iwsmpv2.dll	1.0.0.2	06/28/2012
• PthreadVC2.dll	2.8.0.0	08/22/2011
• QuickCrypt.dll		06/19/2004
• SiritLicenseValidation.dll	1.0.0.4	08/29/2012
• SI-1609_2_parser.dll		12/15/2011
• Viicsec.config		07/18/2012
o Root Certificates		7/18/2012
▪ root_ca.cert		1/23/2012
▪ root_ca.key		1/23/2012
▪ root_ca_dec.key		
WireShark Piping Interface		
• Server	2.0.0.0	2/29/2012
• Client	2.0.0.1	2/29/2012
PCMCIA CB62-001		
• Installer	2.2.8	
• Driver	1.2.1	
Multi-Channel Packet Sniffer Test Tool		
• Sirit.IEEE80211.exe	2.2.0.0	9/19/2012
• Sirit.IEEE80211.exe.config	N/A	6/12/2012
• SiritLicenseValidation.dll	1.0.0.4	2/29/2012
• DsrcESController.dll	N/A	9/19/2012
• Dsrcsniffer	N/A	5/18/2012
• QuickCrypt.dll	N/A	6/19/2012
Linux 1609.2 Security PCAP File Analyzer		

**TEST EQUIPMENT USED:**

Equipment	Manufacturer	Model	S/N	Cal Dates
Variable DC Power Supply	TENMA	72-7245	1100163	FV
Variable DC Power Supply	TENMA	72-7245	1100161	FV
Variable DC Power Supply	MASTECH	HY1803D	294777	FV
Variable DC Power Supply	MASTECH	HY1803D	303110	FV
Variable DC Power Supply	MASTECH	HY1803D	303133	FV
Variable DC Power Supply	MASTECH	HY1803D	303113	FV
12VDC Power Supply	ASTEC	ACV 12N5	0900	N/A
12VDC Power Supply	ASTEC	ACV 12N5	0802	N/A
Digital Timer	GE	15079	EM-A936US1	N/A
Spectrum Analyzer	HP	8564E	3846A01373	3/29/11- 3/29/12
Multimeter	Fluke	189 series	95100155	1/16/12- 6/16/13
Reference Receive Unit (Mobile1)	KAPSCH TECHNOCOM	MCNU R1500S	741401312266 002	N/A
Reference Receive Unit (Bench testing)	KAPSCH TECHNOCOM	MCNU R1500S	7414101312266 003	N/A
Sharkfin DSRC/GPS Antenna & 5M DSRC Cable	Hirschmann	HDSC-HG-0107A-02		
Window Mount DSRC/ GPS Antenna & 5M DSRC Cable Omni-directional Antenna-OBE (5500 MHz-3dBi))	Mobile Mark	IW-5900/1575-7C2HC-BLK-192	N/A	N/A
Omni-directional Antenna-RSU (5850-5925 MHz – 9 dBi)	MaxRaid	Z3258	N/A	N/A
Multi-channel Packet Sniffer	3M (formerly Sirit)	MCPSTT-Fakra-3RX	N/A	N/A
WireShark Packet Sniffer	3M (formerly Sirit)	CB62-001	N/A	N/A
Hygrometer	Control Company	4040	101708297	5/21/11- 5/21/12
SUV (moving vehicle testing)	2010 FORD 2011 GMC	Edge Terrain		N/A
GPS Engine	Ublox	EVU-6H-0-001	N/A	N/A
GPS Reference Unit	Novatel	FLEX6	01018640	N/A

**Table 12 - Test Equipment Used**

FV – Functionally Verified equipment were verified against a calibrated digital multi-meter listed below:

Multimeter	Fluke	189 series	95100155	1/16/12- 6/16/13
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- Ted Mawhinney (Concurrent Technologies Corporation)
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- Ted Osinski (MET Laboratories)
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**OBSERVERS:**